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Readings in the History of the Soil Conservation Service

Economics and
Social Sciences
Division, NHQ

Historical Notes
Number 1

Cover: Constructing a terrace with a Martin Ditcher (North Carolina, 1940)

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Introduction

The articles in this volume relate in one way or another to the history of the Soil Conservation Service. Collectively, the articles do not constitute a comprehensive history of SCS, but do give some sense of the breadth and diversity of SCS's missions and operations. They range from articles published in scholarly journals to items such as "Soil Conservation: A Historical Note," which has been distributed internally as a means of briefly explaining the administrative and legislative history of SCS. To answer reference requests I have made reprints of the published articles and periodically made copies of some of the unpublished items. Having the materials together in a volume is a very convenient way to satisfy these requests in a timely manner. Also, since some of these articles were distributed to SCS field offices, many new employees have joined the Service. I wanted to take the opportunity to reach them. SCS employees are the main audience.

We have produced this volume in the rather unadorned and inexpensive manner so that we can distribute the volume widely and have it available for training sessions and other purposes. Also we can readily add articles in the future.

If anyone should wish to quote or cite any of the published articles, please use the citations provided at the beginning of the article. For other articles please cite this publication.

Steven Phillips, a graduate student in history at Georgetown University and a 1992 summer intern here with SCS, converted the articles to this uniform format, and is hereby thanked for his very professional efforts. Jim Todd of Electronic Scanning and Design created the cover.

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Two Centuries of Soil Conservation

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by Douglas Helms,
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Patrick Henry reportedly remarked after the American Revolution that "since the achievement of our independence, he is the greatest patriot who stops the most gullies."[1] If the quote is not so evocative of patriotism as Henry's other oratorical flourishes, it nonetheless illustrates the early concern over soil erosion and what it portended for the nation. The connection of national welfare to the ability to produce food was already firmly rooted in the young nation.

Soil erosion concerned Americans more than their European ancestors for several reasons. Many of the American staple crops for export--cotton and tobacco--were planted in rows as was corn. Hoeing or plowing between the rows eliminated weeds that might sop moisture. The clean cultivation left the land bare to the impact of the falling raindrop. Rainfall on the eastern seaboard is more intense than in Europe, falling with greater force and splashing up soil particles. Sloping and hilly land which abounds in New England and the piedmont of the South, is particularly susceptible to soil erosion. Soil erosion removed fertility in the top soil, but there was a greater problem--it also removed the soil body, the medium for the growth of plant roots.

Turning up the soil also exposed the organic matter of the top soil to the sun and air, thereby increasing oxidation. Organic matter improves soil tilth, increasing the infiltration of rainfall into the soil as well as helping bind soil particles together. Farmers began discovering a decline in crop production with repeated plantings. The phenomenon was due in part to soil erosion, but it also resulted from not returning anything to the soil in the form of manure, green cover crops plowed back into the soil, or legumes that fix nitrogen in the soil through nodules on the roots.

Farmers could respond to this problem in several ways. They could rotate fields, letting old fields revert to grass, brush, or woodland, and then burning them off. The accumulated organic matter would then support several crops until the process had to be repeated. Or they could abandon the farm and move west to claim new farms. Indeed the availability of land to the west and the scarcity of labor are often seen by historians as the main impediments to the adoption of farming methods that conserve the soil and restore its fertility. Peter Kala, an eighteenth-century Swedish naturalist, saw farm land abandonment and clearing of new ground in New York and observed, "This kind of agriculture will do for a time, but it will afterwards have bad consequences, as every one may clearly see."[2]

A number of commentators and agricultural reformers began proposing various soil conserving practices. Some of the earliest conservationists, such as Jared Eliot, Samuel Deane, and John Taylor, relied on observations and personal experiences in advocating systems of pasture, legumes, and crop rotations, to increase fertility and lessen erosion by maintaining ground cover and improving soil tilth. Though he invented neither, Thomas Mann Randolph perceived the advantages of the hillside plow and horizontal plowing.[3] More often called contour farming these days, this method of plowing involved running the furrows around the hillside on a horizontal plane, rather than up and down hills. Each ridge formed a little dam to check erosion. As a convert to the idea, Randolph's father-in-law, Thomas Jefferson, believed that, "In point of beauty nothing can exceed that of the waving lines and rows winding along the faces of the hills and valleys. The horses draw much easier on the dead level, and it is in fact a conversion of hilly ground into a plain."[4] Farmers could also

build terraces or channels that ran around the hill to intercept and carry off water. Nicholas Sorsby combined horizontal farming with the early precursor of the terrace--the hillside ditch--and greatly popularized "level culture" throughout the South.[5] After the Civil War, Priestly Mangum of Wake Forest, North Carolina, perfected the broadbased Mangum terraces.[6]

Edmund Ruffin of Virginia developed the most elaborate system of what today might be called sustainable agriculture. He used a mixture of decaying sea-shells and clay--marl--that made the acidic soils of the South more productive. He further demonstrated the value of crop rotations and legumes in maintaining fertility. Ruffin especially wanted to stem the tide of farmers leaving Virginia. Though he succeeded locally to some extent, he never revolutionized or reformed agriculture in the South.[7]

While some Americans practiced soil conservation, soil erosion continued to be a problem in the late nineteenth and early twentieth centuries. A few scientists and academics such as W. J.. McGee and N. S. Shaler wrote about the problem. A University of Chicago geologist, T. C. Chamberlain, spoke at the White House in 1908 about the dangers of erosion. But the creation of an awareness in the early twentieth century required something of a crusader. Hugh Hammond Bennett, a soil scientist with the U. S. Department of Agriculture, took on the challenge and came to be regarded as the father of soil conservation.

Several facets of Bennett's personality and background suited him to the role of crusader. First, he had the understanding of the problem due to experience; he grew up in North Carolina, in one of the more erodible areas of the state. In his work as a soil surveyor, and later as supervisor of surveys in the South, he saw the effects of erosion and its impacts on agriculture. By the 1920s, he was actively trying to do something about the problem. His skill as a writer was invaluable in the crusade. Along with W. R. Chapline, he coauthored a USDA publication, *Soil Erosion: A National Menace* (1928), that was a call to action.[8] Other more popular articles reached a wider, and potentially influential, audience. He published articles in *Nature Magazine*, *North American Review*, *Holland's*, *Geographic Review*, *Country Gentleman*, *American Forests and Forest Life*, and *Farm Journal*.

Finally, Bennett was ready to work on pushing his ideas legislatively and administratively. He maneuvered to gain support for a group of research stations that would develop methods of conserving soil. The legislation was included in an amendment to the appropriations bill of the Department of Agriculture in 1929.

The crisis brought on by the Great Depression further provided Bennett with an opportunity when the Works Projects Administration and the Civilian Conservation Corps were created to put people to work. John Collier, Commissioner of Indian Affairs, and Harold Ickes, Secretary of the Department of the Interior, particularly wanted assistance in improving the condition of land deteriorating from overgrazing and erosion on the Indian reservations.

Bennett received $5 million to carry out some soil conservation projects in September 1933. In the new Soil Erosion Service, Bennett located soil conservation projects in the watersheds near erosion experiment stations so that the directors of the stations could utilize the research in-formation. Farmers in the watersheds signed five-year cooperative agreements to install conservation measures. The Soil Erosion Service furnished equipment, seed, seedlings, assistance in planning the measures, and labor from the Civilian Conservation Corps or the Works Projects Administration.

Many of the conservation practices were not new, but the new service planned to utilize numerous methods in a mutually supporting conservation system tailored to the individual farm. Contour farming was strongly emphasized. Many farmers used contour terraces but needed to be introduced to grassed outlets and grassed waterways. Where farmers included hay and

small grains in their operation, strip-cropping under crop rotations was emphasized. To encourage a greater use of grass in the farming operation, the projects introduced the concept of pasture management relying in part on fertilizer. In hilly areas, fencing off woodland from grazing benefitted the cropland below by reducing runoff.

The CCC also collected seed for nursery production of seedlings to reforest areas and carried out thinning and timber stand improvement. Likewise, collecting native grass seed for revegetating rangeland played a large part in demonstration projects in semi-arid areas. Contour furrows and water-spreading systems were introduced to increase infiltration. Springs were developed and stock-watering ponds were sited to distribute grazing. Grass cover for orchards was encouraged. In Pacific orchards, the young conservationists emphasized contour furrows to spread irrigation water rather than letting it run downhill.[9]

The Soil Conservation Act of 27 April 1935 transformed the soil conservation work from a temporary status to a permanent agency--the Soil Conservation Service--with authority to expand the work beyond the demonstration projects to a program converting the entire nation. Bennett, ever the showman, dramatized the need for soil conservation when a dust storm from the southern Great Plains passed over Washington as he was testifying before the Senate Public Lands Committee.[10]

After the passage of the act some people began to examine the best approach to get farmers interested in soil conservation. The most prominent person seeking an alternative to the demonstration idea was M. L. (Milburn Lincoln) Wilson, Assistant Secretary of Agriculture. Under the demonstration projects, the government had supplied not only trained people to give advice, but also some equipment to do the work, and the labor of the CCC, the WPA and supplies. Obviously, such labor would not always be available. Wilson simply believed if the work were to spread nationwide and have an impact on the way people farmed, farmers would be more interested and involved in planning and carrying out of the work.

Wilson conceived of a conservation district, a governmental subdivision of the state, that the local people would organize for the district. The directors or supervisors of the district would be elected or appointed and would direct the activities concerning soil and water conservation within the district. The federal government could supply equipment and technical assistance through trained soil conservation personnel. Henry A. Wallace and President Franklin D. Roosevelt endorsed the proposal, and FDR transmitted the Standard State Soil Conservation Districts Law to governors of the states on 27 February 1937, with the recommendation that the state legislatures enact a law based upon it. Arkansas passed the first such act on 3 March 1937. The Brown Creek Soil Conservation District in North Carolina signed the first agreement with the U. S. Department of Agriculture on 4 August 1937.

Since then, nearly 3,000 conservation districts have been organized. The Soil Conservation Service has nearly 2,700 field offices where technically trained soil conservation personnel work with districts, land owners, and other land users on conservation problems. The districts banded together in 1946 to form the National Association of Soil Conservation Districts, which has been a force in shaping nation conservation policies.[11]

Government, of course, has not been the only force affecting the course of soil conservation in America. Throughout history, prices, markets, transportation facilities, and other factors have contributed to expansions or retractions in using land for crops. Europeans settled New England and removed forests so that by the middle of the nineteenth century, nearly three-fourths of the land was in fields and pasture. After completion of the Erie Canal, New England farmers keenly felt the competition of midwestern farms where the rich prairie soils produced grain crops and cattle in profusion. Industrialization further nudged New England toward reforestation, a

transformation that is now so complete it beckons tourists to gaze at the luxuriant colors in the fall.[12]

Down the Atlantic coast in the "land of cotton," the fall of the fleecy king in mid-twentieth century caused a similar change, though not so dramatic and complete. Pasture land in the South increased from 19.5 million acres in 1929 to 44 million acres in 1977. Cropland shrank from 65.5 million acres in 1929 to 53 million acres in 1977.[13] On the predominantly treeless Great Plains, shifts to cropland were easily made in response to weather and prices. Unfortunately, restoring grass cover is a chancy proposition in the land of uncertain rain.

Some government programs have encouraged shifts from cropland to grass and trees. Actually, reducing the surplus of crops that were costing the government money in price support payments was often the greater impetus rather than soil conservation. The Soil Bank (1956-1964) of the late 1950s and the early 1960s offered farmers three- to ten-year contracts. Not surprisingly the programs were most popular in the Great Plains and the South. Land owners in South Carolina, Georgia, and Alabama put 1,255,531 acres in pine trees under the program.[14] A more recent program, the Conservation Reserve Program of the 1985 farm bill, offers contracts to landowners to restore grass or tree cover on land judged to be highly erodible.

The logic of shifting land that is very susceptible to water or wind erosion to uses for which it is better suited is indisputable. Equally indisputable is that this is not a long-term solution to soil erosion. Acres upon acres of land are needed for crops, yet require some measures that will prevent permanent degradation. Twentieth-century agriculture had been buffeted by a mixture of factors that simultaneously made soil conservation more difficult and yet possible.

What is sometimes called mixed farming, including some field crops and livestock, is good for soil conservation. The dense cover provided by hay, legumes, and pasture, increases water infiltration and reduces runoff that causes erosion. In crop rotations this improves or maintains soil tilth, which again promotes infiltration rather than overland flow of water. Used in strips around the hills or across slopes (strip-cropping), these close growing crops stop the runoff from the clean cultivated row crops such as corn, cotton, tobacco, and soybeans. In the Great Plains a mixture of cattle, wheat, range, and irrigated pasture can mean that strip-cropping is possible, that range land is not overgrazed during drought, and that erodible sandy land is not planted wheat.

The fact is that Americans have tended more to specialization. Wide expanses of wheat fields, dotted with a few large cattle feeding operations, are more often the norm than the diversified farmer-rancher ideal. The Midwest, too, shows the specialization of agriculture. In 1920 two-fifths of the cropland in four cornbelt states (Iowa, Illinois, Indiana, and Ohio) was in corn. By 1982 half of the cropland and more than a third in soybeans--both clean cultivated row crops on which erosion could be a problem.[15]

Technology can cause soil erosion problems, as well as mitigating them. The large tractors pulling wide plows and planting equipment are products of Midwestern factories and Midwestern landscape. Often the equipment is ill-suited to farming on the contour in steeper areas of small farms. Where timeliness and power are valuable for conservation, as in the Great Plains where a tractor can pull large blades just under the earth surface, they are valuable for conservation. The operation leaves stubble on the surface to retard wind erosion, while at the same time cutting off roots that deplete moisture needed for the next crop. Various methods of conservation tillage utilize herbicides to kill weeds and cover crops, yet leave the dead vegetation on the surface. The crop is then planted into this residue.

Technology in the form of improved seed and fertilizers has increased per acre production tremendously since World War

II. Occasionally, the bounty caused some analysts to question whether we need even be concerned about topsoil. Any medium, given enough amendments of fertilizers, should suffice for food production, they contend. Fortunately, this is not the majority opinion, as most Americans continue to believe that the soil and its bounty are a national resource heritage.

Endnotes

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[9] Douglas Helms, "The Civilian Conservation Corps: Demonstrating the Value of Soil Conservation," *Journal of Soil and Water Conservation* 40 (March-April 1985): 184-188.

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[11] R. Neil Sampson, *For Love of the Land: A History of the National Association of Conservation Districts* (League City, Texas: National Association of Conservation Districts, 1985), 49-60.

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[13] Douglas Helms, "Soil and Soil Conservation," in *Encyclopedia of Southern Culture*, ed. Charles R. Wilson and William Ferris. (Chapel Hill: University of North Carolina Press, 1989), 361-363.

[14] Ibid., 362.

[15] John Fraser Hart, "Changes in the Corn Belt." *Geographic Review* 76 (January 1986): 61-62.

The Soil Conservation Service: A Historical Note

by Douglas Helms,
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An earlier version of this article was published as "SCS: 50 Years Young" in *The Farmer* (St. Paul, Minnesota) March 16, 1985. pp. 48-50.

This unnecessary wastage of soil concerns you--and me...Neither as individuals nor collectively can we deny our responsibility...If you will take the trouble to ascertain the facts about our farmland--and other natural resources--and then lend your support to our conservation programs we will get results and hold on to them.

Hugh Hammond Bennett
from *The Hugn Bennett Lectures*

The Soil Conservation Act (Public Law 46-74) of April 27, 1935, specifically directed the Secretary of Agriculture to "establish an agency known as the Soil Conservation Service," which would "provide permanently for the control and prevention of soil erosion."

Some Americans were concerned about soil erosion in the 19th century and even earlier. Southerners, for example, developed an indigenous system of terracing. Some state experiment stations worked on solutions. The Extension Service instructed farmers in terracing methods in some states. Two U.S. Department of Agriculture scientists, Hugh H. Bennett and William R. Chapline, published an influential pamphlet, *Soil Erosion: A National Menace*, in 1928. Congress authorized a series of experiment stations devoted to soil conservation research in 1929. In Texas, beginning in 1929, the Southwest Soil and Water Conservation Conference called attention to the problem.

Despite these early efforts, soil erosion was hardly a matter of national concern and united efforts until the onset of the Great Depression caused a questioning of numerous aspects of American life. The connection between poor, eroded land and poor people came into focus. New programs, the Civilian Conservation Corps (CCC) and the Federal Emergency Relief Administration, were created to provide jobs on projects in the national interest, and natural resource projects received a great deal of support. The National Industrial Recovery Act of June 16, 1933, permitted work on erosion control. Secretary of the Interior Harold L. Ickes selected Hugh H. Bennett to head the new Soil Erosion Service in September 1933. Bennett, a USDA soil scientist, had called attention to the problem through articles and speeches.

Bennett located erosion control work in watersheds near the erosion experiment stations so that the heads of the stations could utilize the research information. Farmers in the watersheds could sign five-year cooperative agreements to install conservation measures. The Soil Erosion Service furnished equipment, seed, seedlings, assistance in planning the measures and labor through the CCC or WPA. Many of the conservation practices were not new, but the new service planned to utilize numerous methods in a mutually supportive conservation system tailored to the individual farm. Contour farming was strongly emphasized. Many farmers used contour terraces but needed to be introduced to grassed outlets, grassed waterways, and grade stabilization structures. Where farmers included hay and small grains in their operations, strip-cropping under longer rotation was emphasized. To encourage a greater use of grass in the farming operation, the projects introduced the concept of pasture management relying in part on fertilizer. In hilly areas, fencing off woodland from grazing benefitted the cropland below by reducing runoff.

The CCC boys also collected seeds for nursery production of seedlings to reforest the areas, as well as carrying out thinning and timberstand improvement. Likewise, collecting native grass seed for revegetating rangeland played a large part in demonstration projects in semi-arid areas. Contour furrows and water-spreading systems were introduced to increase infiltration. Spring development and stock-watering ponds were utilized to distribute grazing. Grass cover for orchards was encouraged. In Pacific Coast orchards the young conservationists emphasized the use of contour furrows to spread irrigation water rather than letting it run downhill.

The Service also operated demonstrations on Indian reservations--most notably the Navajo, where they tried to improve the range through range management while reducing the number of animals and improving the quality of sheep.

The successful works attracted attention from the public as well as from farmers and their congressmen, who sought similar projects for their counties. In fact, the success of the Service became a point of contention between the Secretaries of the Departments of the Interior and Agriculture. Secretary of the Interior Ickes wanted to keep the Service as part of a Department of Conservation, while the Secretary of Agriculture contended it properly belonged with other agricultural programs. President Roosevelt decided in favor of USDA, and the Soil Erosion Service moved to the Department of Agriculture on March 25, 1935. The conservation work emerged from its temporary status to become an enduring activity when Congress passed, and President Roosevelt signed, the Soil Conservation Act of April 27, 1935.

The move to centralize soil conservation work in SCS led to a rapid increase in personnel, funds, and responsibilities. When the Soil Erosion Service moved to USDA in April, there were 40 demonstration projects with 51 CCC camps and some WPA labor. Upon transfer to USDA, SCS assumed supervision of more than 150 Forest Service CCC camps that had been working on erosion control. The Secretary of Agriculture transferred the ten experiment stations from the Bureau of Chemistry and Soils and the Bureau of Agricultural Engineering to SCS, as well as the nurseries for producing plant cover from the Bureau of Plant Industry. Additional work-relief funds enlarged the programs so that, by mid-1936, there were 147 demonstration projects, 48 nurseries, 23 experiment stations, 454 CCC camps, and over 23,000 WPA workers on the job. In locating new projects, the agency relied on the national Reconnaissance Erosion Survey undertaken by SES in 1934.

Consolidation of activities continued through the thirties and early forties. SCS, along with the Forest Service and the Bureau of Agricultural Economics investigated soil conservation measures and runoff control on specified watersheds under the Flood Control Act of 1936. In July 1938, the Service took over the construction aspects of the Water Facilities Program in the western states. The Land Utilization Program, transferred to SCS in November 1938, involved the purchase and rehabilitation of submarginal lands. Also in 1938, the Service assumed responsibility for advising farmers on forestry matters under the Cooperative Farm Forestry Act of 1937. Irrigation and drainage began assuming a larger part in the agency's operations when, in 1939, responsibility for investigations and demonstrations was transferred from the Bureau of Agricultural Engineering. There were some losses in the reorganizations--most notably the withdrawal of authority in 1940 to work on public lands and Indian reservations under the Department of the Interior.

During the Depression, the leaders of the soil conservation program had to look to the future of conservation; thought had to be given to the long-range working arrangements with farmers. CCC and WPA labor would not be available forever. Nor was conservation a matter of simply fixing a problem. Sustained interest among farmers must be promoted. While the demonstration projects proved the value of conservation application on a watershed and did attract many visitors, many farmers were not

located in the CCC and demonstration work areas. Farmers who visited the areas often left desiring similar assistance.

The mechanism for providing for a continuing program was the conservation district, largely credited to M. L. Wilson, Under Secretary of Agriculture. Wilson's brand of agrarian democracy included government assistance to farmers, but also provided for local direction of much of the assistance. His thoughts on the means to involve farmers in the conservation program were embodied in the "Standard State Soil Conservation Districts Law" which President Roosevelt sent to the states' governors on February 27, 1937. If the state legislatures and governors enacted a law which included the basic elements of the standard act then local groups could organize conservation districts. Then the Department of Agriculture would provide assistance, primarily trained personnel, while the districts set the priorities and directed the work.

Arkansas passed the first state act on March 3, 1937, and the Brown Creek Soil Conservation District, which included Bennett's homeplace, signed the first agreement with USDA on August 4, 1937. The conservation district was a novel concept in the federal, state, and local relationship, and it required a great deal of explanation and education. Some states questioned the wisdom of the land-use ordinances in the standard act. Some farm organizations, agricultural agencies, and universities regarded the conservation districts as an unnecessary intrusion into already well-established means of working with farmers. Even in the face of resistance, the district concept proceeded. Not surprisingly, many of the demonstration and CCC work areas quickly organized districts. At the end of 1939 there were 88 million acres in districts. The acreage in districts topped the 1 billion mark in 1947 and the 2 billion mark in 1973.

The fifties brought new programs to the countryside. The Small Watershed Program, enacted in 1954, endorsed the fact that soil and water resources are interrelated and helped reorient conservation programs toward the community approach--an understanding that conservation concerned not only the individual farm but also the community. An understanding of the need to control floods on upper reaches of streams and the need to link conservation measures on the farm to flood control structures for the benefit of the entire watershed was hardly new, having been promoted in the publications *Little Waters* in 1936 and *Headwaters Control and Use* in 1937. The Flood Control Act of 1944 had authorized 11 watersheds for accelerated conservation application. The two programs emphasized a combination of dams for flood control and soil conservation systems on farms in the watershed above the structure. The Small Watershed Program provided assistance--financial and technical--to local groups for watershed improvement and flood control. By 1984, work had been completed on 602 watersheds, while work continues on another 462 watersheds. Since 1982, the Small Watershed Program has increased the proportion of funds devoted to cost-share farm conservation measures and decreased emphasis on building structures for flood control.

The 1956 Great Plains Conservation Program (GPCP), born out of the 1950s drought, gave renewed emphasis to the need to plan conservation for an entire farm or ranch. The program provided a new type of assistance through a ten-year contract. USDA shared the cost of conservation measures, while the farmer agreed to treat the entire farm and to maintain the conservation measures for the period of the contract. The objective, however, was a long-term change, far beyond the length of the contract. The success of contracting with farmers in the GPCP led to adoption of long-term agreements in other conservation programs where the government shared the cost of a conservation measure with the farmers.

The Resource Conservation and Development (RC&D) program was authorized in the 1962 Farm Bill. RC&D promoted the wise use and conservation of resources as a means to increase rural income. A local council of private citizens and the coordinator supplied by SCS initiated a vast array

of innovative projects under their sponsorship. At present 194 areas have organized local councils.

The new programs of the 1950s and 1960s relied on the use of soils information. The merger of the National Soil Survey into SCS in 1952 linked scientific knowledge of soil characteristics to field observations of soil behavior under various uses. The result, in the 1960s and 1970s, was an expansion of interpretations of soil survey information for agricultural and nonagricultural uses. Suburban growth, increased nonfarm rural population, small town and industrial growth created environmental problems and a demand for local, county, and even regional planning assistance as exemplified in the Soil, Water, and Suburbia Conference on 1967. SCS became involved in many non-agricultural activities. Not everyone cheered this expanded role for SCS and its personnel, feeling that sufficient technical assistance was not available to every farmer needing and wanting assistance and that the farmland conservation effort should not be diluted.

In the late 1960s and early 1970s, the SCS programs received increased attention from the environmental movement, not all of it favorable. The watershed program was the object of the first substantial criticism of the agency from former allies. Conservation and environmental groups had been inclined to view SCS's onfarm activities favorably. The channelization phase of the watershed work provoked some criticism for its effects on wildlife and fish population, but it was a broader question predating the watershed program--the effects of drainage and the loss of wetlands--which really spurred the criticism. After Congress enacted the National Environmental Policy Act of 1969, SCS revised the watershed planning process to insure that all effects on the environment were considered. The question of wetlands retention--how much should be protected and who should pay--is still a national concern.

Conservationists received a shock in the early 1970s. In 1973, grain exports nearly doubled over the previous year. With surpluses being depleted, the 1974 prices of corn and soybeans were more than double those of 1970 and wheat prices trebled. Farmers harvested 24 million acres more in 1974 than in 1972. Sixty million acres of new cropland were cultivated between 1972 and 1982--much of it more erodible than the cropland already in production. The increased erosion problem rekindled an interest in conservation among people outside the traditional conservation action groups. In some ways the last decade has been reminiscent of earlier days of the conservation movement when the interest in conservation was shared by many people not directly involved in farming.

The renewed interest in soil conservation led to the 1977 Soil and Water Resources Conservation Act and to intensified study and inventory of resource problems as a basis for directing conservation programs. The studies were new, but the central question was as old as the conservation movement. How do we deal with conservation nationwide, and at the same time direct our attention and efforts to the most severe problem areas? The RCA program, as announced on December 21, 1982, established six objectives: reduce excessive soil erosion, improve water management, reduce upstream flood damage, improve range condition, and improve water quality. The RCA appraisal had identified areas of critical resource degradation. USDA targeted these areas to receive accelerated technical assistance, while maintaining support nationally to all conservation districts.

The events of the 1970s, the study and analysis in the RCA, and the interest of public interest groups resulted in a strong conservation title in the Food Security Act of 1985. The act added a tremendous workload for SCS staff. The law is designed to eliminate the possibility that commodity price support programs encourage poor soil conservation practices or the loss of wetlands. Thus, if farmers do not comply, they are denied certain USDA program benefits. The highly erodible lands provision included both conservation compliance and sodbuster. Under conservation compliance, farmers have until 1990 to begin applying a

conservation plan on highly erodible land and until 1995 to fully install the conservation plan. Under sodbuster, landowners must apply a conservation plan if they wish to bring land into production that had not been used for an annual crop between December 31, 1980 and December 23, 1985. The swampbuster provision, officially titled wetland conservation, was an attempt to slow drainage of wetlands and their conversion to cropland. Farmers who converted wetlands and produced agricultural commodities after December 23, 1985, the date of the passage of the act, would be ineligible for USDA program benefits. Under another provision, the Conservation Reserve Program, farmers are putting highly erodible land into grass, trees, or other cover under long-term contracts.

Beginning in 1988, SCS became increasingly involved in a government-wide Presidential effort to improve and enhance water quality. SCS's part has been to develop means to reduce agriculture's adverse impacts on water quality and to assess the effectiveness of voluntary programs.

For over half a century, research in conservation spread from the work of a few interested individuals to a federal network of research stations, increased emphasis at the state experiment stations, and a realization by industry that farmers want, need, and will purchase equipment designed to conserve land while farming it. The information generated by research must be applied to land by the farmer working cooperatively with a professional well versed in the sciences--the soil conservationist.

Soil and Soil Conservation

Reprinted from Wilson, Charles Reagan, and William Ferris, eds. *Encyclopedia of Southern Culture.* Chapel Hill, N.C.: The University of North Carolina Press, 1989. pp. 361-363.

by Douglas Helms,
National Historian, Soil Conservation Service

Intertwined physical, climatic, economic, and cultural factors brought on severe soil erosion in the South. The Piedmont, the loessial bluff lands east of the Mississippi River, and the red clay hills of Alabama and Mississippi have been the areas of severest erosion. Farming steep slopes with cultivated row crops was the main cause, but soil characteristics also contributed to the erosiveness of these areas. Geologic processes washed the soil particles from the Piedmont uplands to form the Coastal Plain. The erosion plus the intense weathering process left the Piedmont with thin topsoils having little water-holding capacity. Impermeable clay-rich subsoils hastened erosion of topsoil.

The South has the highest annual precipitation in the United States, and the predominance of cultivated staple crops, especially tobacco and cotton, exposed the soil to intense summer thunderstorms. The use of close-growing grain crops, such as wheat and oats, and pasture and hay to support meat and dairying enterprises would have reduced erosion, but such crops held a minor place in southern agriculture. Availability of new lands to the west and south inhibited development of intensive agriculture employing fertilizers and conservation measures. An alternative to moving was to let fields rest for a few years and then extract the accumulated fertility in the organic matter, It was, and still is, a system prevalent in climates where high temperatures and rainfall accelerate leaching and decomposition of organic material, thus creating soils of low fertility and high erodibility.

In the 19th century southerners developed most of their means of contending with erosion. Thomas Jefferson observed horizontal plowing (contour farming) in France. He and his son-in-law Thomas Mann Randolph introduced the method in Virginia. A Jefferson corespondent, William Dunbar, popularized the method in the Natchez District of Mississippi. Another Mississippian, Joseph Gray, invented a level for precision layout of contour rows. By 1850 horizontal plowing was common in the South, In the two decades preceding the Civil War the hillside ditch--forerunner of the terrace--was widely used as an adjunct to horizontal plowing. Nicholas Sorsby devised the most elaborate of these systems and popularized his ideas through a series of publications on "Level Culture."

Several influential southerners, notably John Taylor and Edmund Ruffin, perceived conservation of the soil as necessary to the preservation of southern agrarian life. Ruffin, more than any predecessor, emphasized lime and drainage of level bottom lands. Adoption of Ruffin's teachings had an impact in the Tidewater of Virginia, where the use of green manures, fertilizers, and rotations restored depleted tobacco fields.

After the Civil War short-term sharecropping and rental arrangements aggravated the erosion problem. Piedmont farmers increasingly turned to commercial fertilizers as an alternative to resting fields. Structural measures of erosion control evolved into terracing. The Mangum Terrace, designed about 1885 by Priestly Mangum of Wake Forest, N.C., came into general use. Between 1880 and 1920 most farmers on steep lands in the Piedmont and upper Coastal Plain installed some type of terrace. Faulty design and construction as well as poor maintenance limited their value and occasionally created additional erosion problems.

The present programs of soil conservation began with the crusade of Hugh Hammond Bennett. A native of Anson County, N.C., Bennett proposed using vegetative controls and good land use, along with structural controls in a coordinated conservation plan designed specifically for each farm. Bennett became the first chief of the Soil Erosion Service (SES) in 1933. In 1934 the new agency conducted a reconnaissance erosion survey to ascertain the extent and conditions of soil erosion in Virginia, Tennessee, the Carolinas, Georgia, Florida, Alabama, Mississippi, Louisiana, and Arkansas. The results of the survey are shown in Table I.

The SES's successor, the Soil Conservation Service, moved from working on demonstration projects to cooperation with local conservation districts organized under state laws. The South became the national leader in organizing conservation districts. The obvious need for conservation and Bennett's evangelistic style and moral persuasion appealed to the farmers. District supervisors served without pay and set priorities for the conservationists supplied by SCS. The conservationist relied on an ever-expanding body of knowledge concerning structural design, the value of vegetation, and planting and tillage techniques to assist farmers.

In addition to improved technical expertise, the decline of cotton under the tenant system, mechanization of agriculture, and land use changes have influenced conservation since the 1930s. For example, tractors allowed frequent and deeper plowings that readied the soil for erosion, and large farm equipment was incompatible with the traditional serpentine terraces. As farmers eliminated these terraces, conservationists assisted farmers in installing parallel ones. Such land use changes in the last 50 years have both reshaped the southern landscape and benefited soil conservation.

Animal disease control, purebred cattle, and the introduction and spread of annual pasture grasses by SCS and other federal and state agencies expanded the cattle industry and brought pasture acreage from 19.5 million acres in 1929 to 44 million acres in 1977. High soybean and grain prices and a drop in cattle prices in the early 1970s reversed this trend, but livestock continues to be a major enterprise.

Pine tree occupancy of unprofitable hilly fields is no longer a nuisance to farmers, and expanded forest acreage results in part from developments in forest products technology, and higher prices. Artificial regeneration through planting seedlings has replaced natural reforestation. Under one federal program, the Soil Bank (1956-64), landowners in South Carolina, Georgia, and Alabama planted 1,255,531 acres of the 2,154,428 acres of cropland reforested in the United States.

Cropland shrank from 65.5 million acres in 1929 to 53 million acres in 1977. Erosion-inducing row crops still predominate over close-growing crops, particularly because soybeans occupy much of the acreage formerly devoted to cotton. Regionally, farmers have shifted row crops to the gentler slopes of the lower Coastal Plain, deltas, and bottom lands. With the increase in fertilizer usage, the lower fertility of many Coastal Plain soils, compared to the Piedmont, is no longer a deterrent. Drainage systems, however, are necessary on many of the level fields. Southerners artificially drained 11.3 million acres by 1930 and 36.7 million acres by 1978. The rush to convert the fertile, easily farmed, bottom land hardwood areas to cropland is causing concern among some southerners who want to preserve portions of the area for its aesthetic, historical, recreational, and scientific value.

Along with farmers throughout the United States, southern farmers have increased acreage planted with conservation tillage systems that utilize herbicides to eliminate weed competition. In 1979 farmers used conservation tillage on 22 percent of the cropland, a figure that rose to 35 percent in 1981. In addition to retarding erosion and providing humus to the soil, the system permits double cropping in the southern climate. In traditional small farm areas of the South, where farmers rent widely

scattered tracts of farm land, the time saved is a major inducement.

Southern farmers continue to cite soil erosion as their major resource problem. Twenty-two million of the 54 million cropland acres erode at a rate greater than soil formulation. The fertile, heavily farmed, loessial bluffs erode at four times that rate. But the 32 million acres of cropland on which soil erosion is negligible represent an evolution from an extractive, pioneering ethos to a permanent agriculture.

Table I

Conditions of Southern Soil Erosion, 1934

Erosion condition	Acres	Percentage of total
Total area exclusive of large cities and water)	300,967,150	100
Area with little or no erosion	147,256,748	48.9
Total area affected by sheet erosion	130,226,130	43.3
One-fourth to three-fourths of topsoil lost	94,415,128	31.4
Over three-fourths of topsoil lost	35,801,001	11.9
Total area affected by gullying	127,880,121	42.5
Occasional gullies	110,527,582	36.7
Severe gullies	16,073,713	5.3
Destroyed by gullies	1,548,826	.5

Source: Natural Resources Board, *Soil Erosion: A Critical Problem in American Agriculture* (1935).

Further Reading: Arthur R. Hall, "Soil Erosion and Agriculture in the Southern Piedmont" (Ph.D. dissertation, Duke University, 1948); John Hebron Moore, *Agriculture in Ante-Bellum Mississippi* (1958); Arthur F. Raper, *Preface to Peasantry: A Tale of Two Black Belt Counties* (1936); *Soil Erosion: A Critical Problem in American Agriculture* (1935); U.S. Department of Agriculture, Soil Conservation Service, *Early American Soil Conservationists*, Misc. Pub. 449 (1941), *Soil, Water and Related Resources in the United States: Part I* (1981); Rupert B. Vance, *Human Geography of the South* (1932); Frank B. Vinson, "Conservation and the South" (Ph.D. dissertation, University of Georgia, 1971).

Soil: How We Have Tried to Conserve It

by Douglas Helms
National Historian, Soil Conservation Service

Recognition that Americans should conserve soil to maintain the Nation's capacity to produce food is neither a new, nor an outdated idea. Colonial Americans became aware of the exhaustible, erodible qualities of the new land. Today, even in the face of scientific and technological advances that have dramatically raised per-acre production and cast doubt on the profitability of some soil-conserving farming practices, none, save the most optimistic, believe soil conservation has become irrelevant. There has been, however, much less unanimity of thought on the best means to achieve soil conservation. Through the years, especially during the 20th century, Americans have devised a number of ways to promote soil conservation. Opinions differ as to the effectiveness of each method. When government is involved, individual attitudes about the proper role of government often determine opinions about the desirability of a particular method of promoting soil conservation. None of the methods proved a panacea, but each added to the possibilities. Let's look for a moment at the various methods we have tried.

Science and Research

Americans for the most part have tried to rely on a better understanding of the soil, its responses under various uses, and the influence of various farming practices and machinery to devise ways of reducing erosion. Some few individuals, often unrecorded in history, made original discoveries in wise land use. Walter Lowdermilk found one such individual on his travels, which he recounted in *Conquest of the Land Through 7,000 Years.* He came upon J. Mack Gowder in Hall County, Georgia, who defied local custom in plowing his land so as to leave crop litter on the surface to retard erosion.

Certainly many individuals learned to leave the hilliest land covered with trees or use it for pasture, while cultivating the gentler slopes. Even so, much of the cropland had some erosion hazards. Some of the earliest conservationists, such as Jared Eliot, Samuel Deane, and John Taylor, relied on observations and personal experience in advocating various systems of pasture, legumes, and crop rotations to increase fertility and lessen erosion by maintaining ground cover and improving soil tilth. Though he invented neither, Thomas Mann Randolph, Thomas Jefferson's son-in-law quickly perceived the advantages of the hillside plow and horizontal, or contour, plowing. As a convert to the idea, Jefferson believed that "In point of beauty nothing can exceed that of the waving lines and rows winding along the face of the hills and valleys. "

Nicholas Sorsby combined horizontal farming with the early progenitor of the terrace--the hillside ditch, and greatly popularized "level culture" throughout the South. The most outstanding of the pre-Civil War agricultural reformers, Edmund Ruffin, experimented on his farms learning the effects of green manures, liming on soil conservation and soil fertility. After the Civil War, Priestly Mangum of Wake Forest, North Carolina, perfected the broad-based Mangum terrace.

Few agriculturalists looked upon soil conservation as a key part of the research directed toward increased agricultural productivity in the public agricultural institutions that were created in latter half of the 19th century--the U. S. Department of Agriculture, the land-grant colleges, and the state agricultural experiment stations. USDA and the state experiment stations and extension services did however publish some bulletins on the subject. Eventually, two state experiment stations, those at Columbia, Missouri and Spur, Texas concentrated on soil erosion.

Hugh Hammond Bennett, who led the soil conservation movement in the 20th century,

may best be remembered for his emotional appeals, but it should also be remembered that he first called for research. Knowledge should come before action. Largely at his prodding, the USDA appropriation act for 1929 included provisions for soil erosion and moisture conservation research stations. Bennett's first assistant at the Soil Conservation Service, Walter Lowdermilk, had made some of the seminal discoveries in the relationship of forest litter to runoff. Through the years soil conservation assumed a higher place on the state experiment station agendas. Individuals such as Edward Faulkner, author of *Plowman's Folly*, made contributions as did chemical and implement companies. The prospect of cost efficient and effective methods of conservation still occupies a major place on the agricultural research agenda.

Education

Those who would presume to advise farmers to change farming methods face a basic reality. In a country and a time when the number of farmers has declined, the potential convert has persisted. Often several generations have farmed the same land. Any suggestions for drastic change require persuasion and demonstration.

Edmund Ruffin, the apostle of marl (lime), eventually had considerable impact on American agriculture. But during his lifetime, he had little influence outside his Virginia Tidewater homeland. Terracing gained a foothold in the South, but the frontier of new land burdened any call for conservation that involved labor and capital intensive methods.

When Hugh Hammond Bennett, a soil scientist in the USDA, began his crusade for soil conservation, he proposed to use demonstration methods so that farmers would observe proven methods of soil conservation, then go forth and do likewise. He located the earliest demonstration projects near the erosion and moisture conservation experiment stations, where the results of the research could be put to use.

The Soil Conservation Act of 1935 made possible a continuing commitment to soil conservation and an expanded effort. At first the newly designated Soil Conservation Service added additional demonstration projects. But Milburn L. Wilson, then Assistant Secretary of Agriculture, had a plan for making conservation expertise more readily available for farmers. His plan, the soil conservation district, also provided for more local participation in planning operations and in so doing secured political support from farmers who would be critical to the continuation of the soil conservation activities. On February 27, 1937, President Franklin D. Roosevelt, transmitted to the governors the "Standard State Conservation Districts Law." After each state passed an enabling law, local areas, based on a watershed, or later on county boundaries, organized districts and elected supervisors. The districts then signed agreements with USDA. Through the years, the primary form of assistance from USDA to the nearly 3,000 conservation districts has been supplying trained soil conservationists to the districts to work directly with farmers. The districts or states can also supply additional personnel. The districts provide training and information, including buying and renting out equipment. In addition to the active state programs to expand staffs in Pennsylvania, Minnesota, Illinois, Iowa, and Missouri, some states such as Nebraska have increased the responsibilities and powers of the districts to include practically all resource concerns.

Sharing the Costs

Expenditures on soil conservation, at all levels of government, are premised on the idea that society has an interest in preventing erosion. Providing part of the cost is viewed not only as a matter of equity, but also as a means of achieving society's goal by inducing farmers to practice conservation. In early demonstration projects, SCS provided labor--Civilian Conservation Crops enrollees or Work Projects Administration laborers--seed, seedlings, lime, and fertilizer to help make useful adjustments such as establishing pastures, vegetating gullied areas, or working close growing hay crops into crop rotations, building terraces, and fencing, and improving woodland.

Sharing the cost of conservation became a major part of agricultural programs with the passage of the Soil Conservation and Domestic Allotment Act in 1936. As part of a plan to reduce surplus crop production by reducing acreage, participating farmers shifted some land from soil-depleting crops to soil-building crops. Another part of this effort involved making payments to install soil conservation practices on croplands and to improve grasslands. This Agricultural Conservation Program, administered by what is now the Agricultural Stabilization and Conservation Service, added numerous practices as technology became available or cropping patterns shifted. The ACP funds along with the funds spent by SCS in assisting farmers constitute the largest part of the federal contribution to soil conservation. Some state governments, notably Missouri, Alabama, and Iowa have active cost-share programs.

USDA and Congress added new concepts to cost-sharing. In response to drought, Congress authorized a Great Plains Conservation Program in 1956. The program sought a readjustment in farming and ranching operations that would not only conserve soil, but also foster more stable farming operations in an area of extreme climatic variability. Long-term contracts between farmers and USDA helped farmers convert erodible cropland back to grassland. Under the contracts, farmers had to carry out conservation on the whole unit--not just on the land on which the farmers received cost-sharing. The objective was to induce, with society bearing part of the cost, a shift in farming practices that would persist long after the contract expired. There were benefits and obligations on both sides, and farmers had to forego some options in farming operations.

Contracting never supplanted annual cost-sharing, but it was successful enough to be tried in other areas. The Water Bank Program tried to resolve disputes over drainage of "potholes" in the upper Mid-West and the Great Plains. Essentially, society placed a value on migratory birds, and paid farmers under a contract to maintain the wetlands that sustained the annual migrations. The concern over water quality, and part played by agricultural led to the Experimental Rural Clean Waters Program. This small pilot program used contracts with farmers to examine or demonstrate the relationship of soil and water conservation to water quality. USDA now uses long-term contracts in its land-treatment watersheds that emphasize land-treatment rather than floodwater-retarding structures.

Land Use Conversion Programs

Converting very erodible cropland to forests or grasslands has had a great appeal to people concerned about soil erosion. Frequently called "land retirement" programs, these programs generally had as a goal not retirement, but conversion of land to another use. Congress and USDA often had objectives in addition to soil conservation when instituting such programs.

The Land Utilization Program, begun under the Federal Emergency Relief Administration in 1933, and continued under Title III of the Bankhead-Jones Farm Tenant Act of 1937, purchased "submarginal" lands. The submarginal land concept involved susceptibility to erosion, but it also implied inherent qualities that limited the land's potential for profitable agriculture. In some cases, the readjustment meant consolidation of small units of cropland into larger units that could be leased as grazing land. The purchased areas created, or expanded, federal and state parks and forests and wildlife refuges. Some of the purchased areas in the Great Plains eventually became part of the National Grasslands system.

The "conservation reserve" segment of the Soil Bank (1956-1960) had dual objectives--conserving soil and alleviating surplus production by a long-term reduction in cropland. Farmers, at the zenith of program participation in 1960, had placed over 28,000,000 acres in the program under 3-, 5-, or 10-year contracts. In addition to the annual rental payments, farmers received cost-share assistance to seed grasses and legumes, plant trees, establish wildlife cover, manage water and marsh for wildlife, and construct dams and ponds for

livestock, irrigation water and fish on nearly 21,000,000 acres. Congress did not limit the Soil Bank to erodible land, but the program won greatest acceptance in the Southeast and Great Plains where susceptibility of erosion often coincided with low productivity or risky agriculture.

The current cropland reduction effort, the Conservation Reserve Program authorized in the 1985 farm bill, limited the program to "highly erodible" land. Crop surpluses again gave impetus to paying farmers to convert cropland to other uses. But other forces caused eligibility to be limited to erosion-prone land. Understanding of the erosion processes has increased, enabling conservationists to estimate sensitivity to erosion damage, and progress in making soil surveys made it possible to identify highly erodible land. Secondly, a coalition of environmental groups influenced Congress to restrict the conservation reserve to the most erodible land. In addition to their long-standing emphasis on wetlands, wildlife interests focused on cropland conversion as a means of increasing the variety and distribution of upland wildlife.

Profitability

The profitability of conserving topsoil appeared to be a much simpler question before the benefits of scientific agriculture became available. The ever-increasing effectiveness and use of fertilizers especially clouded the perception that expenditures for conservation would be repaid in the farmer's life-time. Horizontal plowing, as Jefferson observed, strained the horse less than plowing up hill. Certainly, farmers suffered economic losses from gullies which not only removed the topsoil entirely, but left the remaining land more difficult to farm. But what about that almost imperceptible amount of soil lost through the process we know as sheet erosion? At what cost should the farmer maintain that soil in place?

Under a general, less specialized, farming involving livestock, both for sale and horsepower, the pasture and hay fit nicely in conservation plans to provide cover on erodible land and to maintain soil tilth. As the contributions of science and technology became available, the ratios of cost of production shifted dramatically. The amount of labor and land needed to produce a given amount decreased, as the machinery, seed, fertilizer, and pesticide components in crop production increased. Improved seed varieties and powerful fertilizers raised productivity and called into question the need for soil conservation measures. Amidst this trend, conservation tillage offered savings to farmers. Because of the objective of leaving crop residues on the surface, farmers forego the cost of several rounds of seedbed preparation and weed-killing cultivation.

Costs of erosion are not limited to the lost productivity; there are costs away from the field, or off-site, that should be counted. Sedimentation specialists in the 1930s studied filtration reservoirs in order to understand erosional processes; their studies also illuminated the off-site costs. Currently, there is much interest in measuring these off-site costs throughout the system from detachment to deposition.

Stewardship

According to some sources, Patrick Henry proclaimed shortly after the American Revolution, "since the achievement of our independence, he is the greatest patriot who stops the most gullies." The sentiment that conservation should be viewed not only as a matter of self-interest, but as an obligation, had, and continues to have many forms of expression. Certainly, a dispassionate case can be made for soil conservation, but like many another movement that came to be enacted into a national program by Congress, it involved emotions. Given the backdrop of the human drama of tenancy, poverty, aimless migration, and dust storms, Hugh Hammond Bennett made his case for soil conservation. Contemporaries who heard those speeches remembered the feeling he brought to the task. To one he was the "fiery apostle;" another remembered that he "loved to carry the message;" another recalled that Bennett left no doubt that conservation was good--erosion an evil.

Bennett's contemporary, Aldo Leopold, pioneer in wildlife management in the Forest Service, influenced the wildlife programs of early SCS demonstration projects but is best remembered for his writings that called upon us to maintain a "land ethic."

Soil conservation as a religious duty found expression in "Soil Stewardship Week." *Farm and Ranch* magazine sponsored a "Soil and Soul Sunday" from 1946 until 1954. The National Association of Conservation Districts assumed responsibility in 1955 and elicits support from many denominations.

Problem Areas

Let it not be said that Americans have not studied the location of problem areas. As early as 1931, Hugh Hammond Bennett mapped "Regional Soil Erosion Areas," during his travels to select sites for soil erosion and moisture conservation experiment stations. In 1934, the Soil Erosion Service carried out a national erosion reconnaissance under the aegis of the National Resources Board. The Soil Conservation Service published national "inventories of conservation needs" (1945, 1958, 1967) and "national resources inventories" (1977 and 1982). The idea that soil conservation funds and efforts should be concentrated on the most erodible land has had great appeal among critics of current programs, but considerably less political appeal and support. The Great Plains Conservation Program represents the difficulty of focusing on specific areas. For the most part the program received favorable reviews, and at one time served as the model for an attempt to legislate additional "special areas." Congress did not authorize additional special areas, however, and GPCP remained small compared to national programs providing technical assistance and cost-sharing. The conservation reserve authorized in the 1985 farm bill is directed toward erodible areas, but generally Congress and conservation districts believe that all states should receive federal assistance and hold that soil erosion is only one of the resource problems with which the districts deal.

Conservation and the Law

The Federal government has generally left any question of land-use ordinances to states. The standard state conservation districts law included provisions for land-use regulations governing use of lands within the district in the interest of conserving soil and controlling erosion. Districts have most often used the provisions where the actions of an individual affected the community, especially in the Great Plains. Adjoining land owners often bore the cost of dealing with dirt from wind erosion-prone lands that should have been left in grass. Not surprisingly agitation for the conservation compliance provisions of the 1985 farm bill came from areas subject to wind erosion in the Great Plains. The provisions deny participation in USDA commodity price support, loan, and credit programs to farmers who crop highly erodible land without carrying out conservation measures.

Conclusion

When a national soil conservation program began in the 1930s, the young group of conservationists attacked their job with enthusiasm. Being optimists, and no better seers than we are today, they were perhaps unmindful of how a dynamic agriculture could undermine some of their good works. But they did establish an objective by which to judge various conservation methods--an enduring agriculture. Enduring didn't imply a static agriculture, but it held that the means to sustain agriculture, the physical integrity of the soil resource must be maintained. We should be mindful of the interplay of the qualities of the land and of people and their institutions in our quest to mix the best existing with the most promising new means to conserve topsoil.

Soil Conservation Is an Old-Time Religion

Reprinted from *Our American Land: 1987 Yearbook of Agriculture.* Washington, D.C.: U.S. Department of Agriculture, 1987. pp. 175-180.

by Douglas Helms,
National Historian, Soil Conservation Service

The idea that Americans should conserve soil to maintain the Nation's capacity to produce food is neither new nor outdated. Some colonial Americans knew the dangers of exhausting the land and undertook conservation measures even then. Some of the earliest conservationists increased fertility and lessened erosion by maintaining ground cover, improving soil tilth, and instituting pasture, legume, and crop rotation systems.

Though he invented neither, Thomas Mann Randolph, Thomas Jefferson's son-in-law, quickly perceived the advantages of the hillside plow and horizontal, or contour, plowing. As a convert to the idea, Jefferson believed that "In point of beauty nothing can exceed that of the waving lines and rows winding along the face of the hills and valleys."

Nicholas Sorsby combined horizontal farming with the early progenitor of the terrace--the hillside ditch-and greatly popularized "level culture" throughout the South.

The most outstanding of the pre-Civil War agricultural reformers, Edmund Ruffin, experimented to learn the effects of green manures and liming on soil conservation and soil fertility. After the Civil War, Priestly Mangum of Wake Forest, North Carolina, perfected the broadbased Mangum terrace for managing surface runoff.

Few agriculturalists viewed soil conservation as vital in the public agricultural institutions created in the latter half of the 19th century. These were the U.S. Department of Agriculture (USDA), the land-grant colleges, and the State agricultural experiment stations. USDA and the State experiment stations and Extension Service did publish bulletins on the subject. Eventually, two State experiment stations, those at Columbia, Missouri and Spur, Texas, concentrated on soil erosion.

Hugh Hammond Bennett, who led the soil conservation movement in the 20th century, first called for research. largely at his prodding, the USDA appropriation act for 1929 included provisions for soil erosion and moisture conservation research stations. Bennett's first assistant at the Soil Erosion Service, Walter Lowdermilk, made seminal discoveries in the relationship of forest litter to runoff.

Education

When Hugh Hammond Bennett began his crusade for soil conservation as a soil scientist in the USDA, he proposed to use demonstration methods so that farmers would observe proven methods of soil conservation, then go forth and do likewise. He located the earliest demonstration projects near the erosion and moisture conservation experiment stations, where the results of the research could be put to use.

The Soil Conservation Act of 1935 enabled Assistant Secretary of Agriculture Milburn L. Wilson to make conservation expertise more readily available to farmers through soil conservation districts. This provided for local participation in planning operations and attracted political support from farmers. On February 27, 1937, President Franklin D. Roosevelt transmitted the "Standard State Conservation District Law" to the governors. Each State then enabled local people to organize districts and elect supervisors. The district then signed agreements with USDA.

Trained USDA soil conservationists work directly with farmers in the nearly 3,000

conservation districts. The districts or States sometimes provide additional personnel.

Sharing the Costs

Sharing the cost of conservation became a major part of agricultural programs with the passage of the Soil Conservation and Domestic Allotment Act in 1936. Spending public money on soil conservation is premised on society's having an interest in preventing erosion. It is viewed not only as a matter of equity, but also as an inducement for farmers to practice conservation. In early demonstration projects, SCS provided Civilian Conservation Corps enrollees or Work Projects Administration laborers. Additionally, SCS provided seed, seedlings, lime, and fertilizer to help farmers to establish pastures, restore gullied areas, and work hay crops into crop rotations, and helped to build terraces and fencing, and improve woodland.

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The current cropland reduction effort, the Conservation Reserve Program authorized by the 1985 farm bill, limits the program to "highly erodible" land. Crop surpluses again gave impetus to paying farmers to convert cropland to other uses. But other forces caused eligibility to be limited to erosion-prone land. Understanding of the erosion processes has increased, enabling conservationists to estimate sensitivity to erosion damage, and progress in making soil surveys made it possible to identify highly erodible land. Then too, a coalition of environmental groups influenced Congress to restrict the conservation reserve to the most erodible land. In addition to their long-standing emphasis on wetlands, wildlife interests now focus on cropland conversion as a means of increasing the variety and distribution of upland wildlife.

Profitability

The profitability of conserving topsoil appeared to be a much simpler question before benefits of scientific agriculture became available. Effective use of fertilizers clouds the perception that expenditures for conservation will be captured in the farmer's lifetime.

Costs of erosion are not limited to the lost productivity; costs away from the field, or offsite, also should be counted. Sedimentation specialists in the 1930s studied siltation reservoirs in order to understand erosional processes; their studies also illuminated the offsite costs.

Stewardship

According to some sources, Patrick Henry proclaimed shortly after the American Revolution, "since the achievement of our independence, he is the greatest patriot who stops the most gullies." The sentiment that conservation should be viewed not only as a matter of self-interest, but as an obligation, had, and continues to have many forms of expression. Certainly, a dispassionate case can be made for soil conservation, but like many another movement that came to be enacted into a national program by Congress, it involved emotions.

Soil conservation as a religious duty found expression in "Soil Stewardship Week." *Farm and Ranch* magazine sponsored a "Soil and Soul Sunday" from 1946 until 1954. The National Association of Conservation Districts assumed responsibility in 1955 and elicits support from many denominations.

An Enduring Agriculture

When a national soil conservation program began in the 1930s, the young group of conservationists attacked their job with enthusiasm. Being optimists, and no better seers than we are today, they perhaps were unmindful of how a dynamic agriculture could undermine some of their good works. But they did establish an objective by which to judge various conservation methods--an enduring agriculture. Enduring did not imply a static agriculture, but it held that the means to sustain agriculture,

the physical integrity of the soil resource, must be maintained.

How SCS Came to Be

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by Douglas Helms,
National Historian, Soil Conservation Service

Those brief, exciting, often hectic 20 months between September 19, 1933, when Hugh Hammond Bennett became Director of the Soil Erosion Service (SES), and April 27, 1935, when the Soil Conservation Act was passed, were important times for the future course of the conservation movement. That there would be national legislation to provide for a continued commitment to soil conservation was by no means assured. Current friends of the conservation movement can look to that period with a sense of admiration; not with a feeling that no mistakes were made, but with an appreciation for the early leaders who transformed vision into reality.

Certainly, Hugh Bennett foresaw and worked for a government organization dedicated to soil conservation. His vision of a permanent agriculture had no room for a brief flurry of emergency employment activities that would fade from the tapestry of conservation once the crisis had passed. Shortly after taking up the new work he wrote to his second in command, Walter C. Lowdermilk: "We are getting into a line of work which I think is bound to carry on...We have no insurmountable wall of prejudice standing out in front of us. The road is wide open, and if all of us are duly consumed with the magnitude of the undertaking, the importance of succeeding in our plan, and the absolute necessity of not giving an inch until we have really accomplished something on a large scale, then we are bound to carry on until we have completed the task laid out for us."

It was as though Bennett's career had been an apprenticeship for the work he was now beginning. His experience--and opinions as to corrective measures--was SES's main asset as the young group went about its work in a manner that enhanced its chance for permanence, rather than in a manner that ensured its demise after the Depression. Through the years of reading, corresponding, and conversing with the handful of people active in soil conservation, Bennett knew to whom he would entrust the field work--the work that would actually determine the success or failure of the program. These were the people who believed as he did in a coordinated approach to conservation employing "all practical measures of control in accordance with the adaptability of the land." His early correspondence makes clear that he thought the coordinated farm plan would involve the cooperative efforts of agronomists, foresters, range specialists, soil experts, engineers, and economists.

Equally important to the future of the work was his determination that the money be spent on conserving farm lands with a future, and demonstrating that expensive land restoration would not be necessary under proper land use.

The watershed-shed projects--demonstrational as well as experimental--would reveal the benefits of conservation area wide, beyond the individual farm. Another important tactic in the early days involved Bennett's attitude toward educating the public. He wanted to influence the body politic, not just the farmers. It was his ability to communicate, with the written and the spoken word, at all levels which started and sustained the movement during its early days.

To be sure, there were factors beyond SES's control which created a climate favorable to continuing the work: the persistent Depression, the dust storms blown eastward, and the magazines and newspapers with heart-rending photographs which documented poor land and poor people in a clearer focus than ever before.

Out in the field the demonstration projects were popular. Requests by farmers and their Congressional representatives for Civilian Conservation Corps camps and projects further enhanced the reputation of the Service. But the Congressional authorization for spending would expire on June 15, 1935. The impending deadline, combined with Bennett's desire for a permanent organization, brought things to a head.

Agricultural groups argued that such work belonged in the Department of Agriculture (USDA). Conservation friends in Congress stood ready to introduce legislation including all the authorities needed for a soil conservation agency. The prospect of legislation forced President Roosevelt to deal with the situation. He summoned Bennett to the White House in March 1935.

The conversation (as recounted by Bennett) showed how successful he had been. The President thought Bennett's group must be doing a good job since they had become the object of desire for acquisition. It seemed to the President that the agricultural nature of the work merited a change to USDA. With the President's blessing, events moved quickly and smoothly. On March 25, 1935, he transferred SES from the Department of the Interior to USDA. After brief hearings Congress passed the Soil Conservation Act which the President signed on April 27, 1935. All who had taken part in the movement could take pride in the charge of the Service, which was "to provide permanently for the control and prevention of soil erosion and thereby to preserve natural resources."

Conservation Districts: Getting to the Roots

To be presented at the 7th International Soil Conservation Organisation Conference in Sydney, Australia, September 27-30, 1992.

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The author thanks Anne Henderson, Soil Conservation Service, Washington, D.C., for her editorial assistance.

The theme of this conference, "People Protecting Their Land," addresses the crucial link in any soil conservation program, the landholder. Governments may try various means to promote soil conservation such as research, financial and technical assistance to landholders, education, moral appeals, and regulation. But if governments are to succeed, they must take into account the attitudes and motivations of the landholders and ultimately enlist their cooperation. Implicit, if not always elucidated, in calls for conservation is belief that conservation has values for society as a whole and that we must conserve resources for future generations. Often these values fit nicely with the everyday objectives of the landholder, but not always. The question then becomes how to satisfy these various objectives equitably.

The soil conservation movement in the United States established a government agency, the Soil Conservation Service (SCS), numbering about 13,000 employees spread throughout the country. SCS works in cooperation with nearly 3,000 conservation districts to assist landholders in the districts.

The districts, which are often conterminous with counties, are organized under state law and are directed by locally elected directors or supervisors. This partnership sustained the conservation movement in the United States. This paper will focus on the historical experiences of working with local groups, specifically conservation districts, in achieving conservation. The purpose is not to promote districts as an ideal instrument worldwide, but to increase awareness of this system so that others may further examine its elements if the district concept seems promising.

Hugh Hammond Bennett, more than any other person, influenced the development of the soil conservation movement in the United States. Study and observation during his career as a soil scientist in the U. S. Department of Agriculture convinced him that soil erosion was a menace to long-term productivity of the land. The Great Depression provided Bennett with an opportunity when public works programs were created to put people to work. Beginning in 1933, as head of the Soil Erosion Service, he received some of the emergency employment money to demonstrate soil and water conservation methods in selected watersheds. The work proved popular and the Congress then created the Soil Conservation Service with the Soil Conservation Act of 1935. For the most part the early agency continued to promote soil conservation through the demonstration projects as trained soil conservationists worked directly with farmers. The availability of labor and equipment greatly facilitated the adoption of these measures (Helms, 1985).

Meanwhile, M. L. (Milburn Lincoln) Wilson, assistant secretary of the U. S. Department of Agriculture (USDA) and one of America's most innovative agricultural policy-makers, had been thinking about ways to spread soil conservation beyond the scattered demonstration projects, and to make it a force for agricultural reform. Several principles guided his thinking. Farmers had to feel that they had an active role in promoting soil conservation if they were to accept it as a goal and ultimately a regular part of their farming operations.

Also, Wilson recognized that the acceptance of conservation in the demonstration projects rested partly on the fact that equipment, labor, and the assistance of trained soil conservationists were available to farmers. This kind of assistance was not available outside the demonstration projects. Belief in soil conservation was insufficient to spread adoption of conservation measures outside the projects. Wilson's dilemma was how to make farmers feel more involved and in control, and how to provide the assistance, not just on demonstration projects, but nationwide to bring soil conservation to all the Nation's farmlands (Glick, 1990).

With the assistance of Philip M. Glick, a lawyer in the U. S. Department of Agriculture, Wilson's ideas were embodied in the "Standard State Soil Conservation District Law." The conservation district, as outlined in the standard law, was a new device in American federalism. It was classified as a "special district" because it had limited purposes and was not a local unit of general government as is the county or city. Just to list a few of the powers of the district, it could conduct surveys and research, disseminate information, conduct demonstrations, carry out prevention and control measures, acquire land and property, sue and be sued, and promulgate land-use regulations. In some instances these authorities paralleled the authorities of the Soil Conservation Service, thus accommodating cooperative ventures. In other cases the districts could do things which the federal government could not do. In short, adding the districts enhanced and expanded the soil conservation movement. Philip Glick has suggested that this type of American federalism with cooperation among federal, state, and local entities resembled not so much a layered cake, but a marble cake (Glick, 1967 and 1990).

Organization of districts proceeded after state legislatures passed a law based on the "standard law." If the local people then voted for the district in a referendum, they elected directors and supervisors of the district. Then the districts signed an agreement with USDA. The working relationship that has developed over the years is for the districts to sign agreements with individual farmers and ranchers. Then trained soil conservationists from the Soil Conservation Service field offices worked individually with them on conservation problems.

A few examples can illustrate the work of districts. For instance, they helped apply conservation to the land by making specialized equipment available. Districts often purchased specialized equipment such as grass seeders, spriggers, or tree planters and rented them to farmers. Most farmers would need such equipment only a few times. During the last couple of decades, districts have promoted various reduced tillage systems which leave crop residues on the land surface and thus reduce soil erosion. The technique required specialized equipment or modifications in conventional planting equipment in order to plant through crop residues. Advocates of conservation tillage have tried to gain converts by getting them to use the technique on a few acres. If the farmers are satisfied that it works well and profitably with their particular cropping systems, then they may well be inclined to purchase equipment. Some districts purchased equipment and rented it to farmers for field trials with the idea of promoting a revolution in tillage systems.

In addition to making equipment available, some districts provided services such as tree planting. The operations of the Southern Soil Conservation District in West Virginia in the early 1970s provided examples of what districts might do. The district's tree planting crew planted seedlings for district cooperators for a fee. The district employees helped construct watering troughs and develop springs. These activities promoted grassland farming over tilled crops on the steeper land. District crews also helped in reclamation of gullied areas. Districts acquired plants which provided habitat for wildlife from the state Department of Natural Resources and supplied them to the farmers at a fee. For farmers who wanted to develop stock watering facilities from springs, the districts lent equipment as well as selling supplies which were not available on the local market

(Southern Soil Conservation District, 1972). After World War II districts received surplus military equipment, which was also adaptable for building terraces and installing other conservation practices. Now most of these mechanical practices are installed by contractors while the Soil Conservation Service provides the guidelines and specifications. But districts have been invaluable in providing conservation services and materials which were not yet commercially viable.

In a way the system of district and state cooperation with the federal government could produce a service that was greater than the sum of its parts. For instance, the Soil Conservation Service had the staff to develop standards for various conservation practices and modify them to fit the local area. But the state, county or districts could accelerate conservation by helping to pay for installing conservation practices or by hiring additional technical staff. In those states which chose to hire additional staff, one might walk into a field and find people paid by the federal government, the state, or the district. Yet all would be doing similar work, using similar methods.

The districts focused first on promoting soil conservation. But additional federal and state legislation continually altered and expanded their role. New federal legislation for flood control in the small upstream watersheds passed in 1954 brought involvement in watershed projects for flood control, drainage, recreation, municipal and industrial water supply, and other purposes. Districts had to adjust to be an effective force in a changed economy in the United States. While many districts remained predominantly rural, others saw small towns grow and suburbia spread onto farmlands with the accompanying problems of increased human activity and resource pressures. The information available from the Soil Conservation Service through districts, such as soils information, knowledge of flooding hazards, erosion control techniques, and a host of other information, could be valuable in helping guide residential and business development wisely. Counties might choose to require that development plans be reviewed by the districts for approval. Districts became leaders in the passage and enforcement of erosion and sediment control laws designed to reduce sedimentation from construction sites.

The districts' national organization, the National Association of Soil and Water Conservation Districts (later the National Association of Conservation Districts), suggested changes districts might make to be more effective in the changed world (National Association of Soil and Water Conservation Districts, 1966). The report of NACD's District Outlook Committee urged districts to be inclusive and to be the natural resources representative not only of agriculture but also of business, industry, recreation, and community interests. State leaders sought changes in the state conservation district law to accommodate this broadened role. Between 1966 and 1969, some 82 changes were made in state conservation district laws (Sampson, 1985). Districts became a voice in erosion and sediment control laws designed to reduce sedimentation from construction sites.

Through the years the financial contributions of state and county governments grew. From 1973 to 1983, state appropriations for conservation districts programs doubled from $42 million to $96 million. By 1992, the appropriations from state and local sources amounted to about $493,000,000. Sources other than federal funds provide for 7,000 employees, about the same number as the SCS people in field offices. About one-half of the district employees are secretarial; thus SCS is providing a larger portion of the technical staff. In a few states, staff funded from state and local sources outnumbered the Soil Conservation Service personnel, but these states were the exception rather than the norm (NACD, 1991).

Developments during the last two decades in Nebraska represent another step in the maturation of the conservation district ideal. Nebraska currently has 23 natural resources districts with a broad-based natural resources agenda. Since the late 19th

century special districts in Nebraska proliferated as they were created for irrigation, drainage, soil conservation, watersheds, rural water development, reclamation, sanitation, mosquito control, and other purposes. By the late 1960s there were some 500 special purpose districts created to deal with resource conditions. Officials in Nebraska, especially Warren Fairchild, Executive Secretary of the Nebraska Soil and Water Conservation Commission, recognized that there were too many districts with fragmented authorities and too little funding to be effective. They were influenced by the analysis of districts made by the District Outlook Committee of the National Association of Conservation Districts. Without providing specific guidance the committee did recognize the problem of the proliferation of special districts and the need for soil conservation districts to assume greater responsibility in the changed rural world. Nebraska legislation passed in 1969 called for natural resources districts to commence operations in 1972. Nebraska consolidated 154 special purpose resource districts into 24 natural resource districts in 1972 (Jenkins, 1975).

After 20 years some of the advantages of the Nebraska plan are obvious. One is the financial base. The legislation provided that districts be funded from the property tax. Statewide, districts received about one percent of the property taxes paid in the state. This contrasts with the "standard law" which did not recommend that districts be funded from property tax. M. L. Wilson believed such a provision would be the death knell of district law in state legislatures during the midst of the Depression (Glick, 1990). The assured funding makes it possible to hire a professional staff, which in turn makes the districts more effective. Since the districts are much larger than the typical soil and water conservation districts, there are some economies of scale involved and less money is spent for overhead expenses. The staff makes it possible for districts to be involved in a variety of activities and cooperative agreements with various state and local agencies, not just the Soil Conservation Service. The districts are large enough to have a voice in state government and to promote their interests. Districts which include both rural and urban areas can effectively deal with issues that connect the two such as water quality, flooding, and other issues. Since district directors are elected, there may be some fear that urban residents would dominate. But according to Steven G. Oltmans, general manager of the Papio-Missouri Natural Resources District, which includes Omaha, the urban contingent has been generous in spending the district's funds in the countryside for traditional soil and water conservation measures (Oltmans, 1992).

The natural resource districts do not see themselves as replacing the services provided by the Soil Conservation Service and duplicating the expertise SCS brings to conservation problems. Each district cannot reasonably do all the research needed and the development of methods and standards. But they can help accelerate the application of conservation practices in the countryside. The districts also worked on conservation problems outside the purview of SCS. The lack of administrative funds made the conservation district too dependent upon the Soil Conservation Service and perhaps too restricted in its natural resources agenda (Glick, 1990). The source of funding brings Nebraska natural resources districts closer to the original ideal of a district as a comprehensive resource agency for the local area. With the shrinkage in the number of farm operators and the need for districts to have a firm financial base, the consolidated districts with broadened authorities merit consideration.

Natural resource districts as they exist in Nebraska are the exception rather than the rule. The assured funding increased the influence of the local entity. For too long in their history many of the districts were allied exclusively with SCS or had little staff and funds to launch their own initiatives. The Nebraska model may not be the ideal for all of the United States, let alone the world. But it exhibits the potential of the district concept.

Summary

What might one say about the importance of districts in advancing soil and water conservation farming in the United States? What are the possibilities for using the concept elsewhere? First of all, the districts accelerated acceptance of soil conservation in the United States by making landholders feel a part of the movement. The movement was not led solely by government agencies, but also by landholders who converted friends and neighbors to the values of conservation farming. On the other side, this neighborly aspect has sometimes been a source of criticism about districts. It was difficult to make the hard choices where regulatory authorities were needed. This last issue has a paradoxical aspect. Recent federal farm legislation in the United States contains conservation requirements for farmers who receive crop support payments and other assistance from the U. S. government. But these regulatory activities should be seen as an addition to the conservation movement, not a replacement. All resource problems will not be solved through this instrument, and the need for local involvement will remain.

Within the American system of government the districts, through their national association, have influenced Congress to provide for soil and water conservation. They have been a major force in securing funds for the Soil Conservation Service. In the early history of the movement, there were a couple of times when the Soil Conservation Service might not have survived as an agency without the support of the districts. This is not to say there would have been no governmental support of soil and water conservation. But there might well not have been an agency charged to work primarily on soil and water conservation programs. Legislatively, the districts individually and through their association influenced other environmental legislation, and along with SCS they are seen as the primary delivery system to transfer legislative intent from Congress into action in the countryside. On the local level, the districts, especially in the case of Nebraska, offer a way to deal with a multitude of private and governmental agencies on a wide range of resource issues.

Any conservation advocate outside the United States should keep a few things in mind when evaluating the districts. The standard law was written with the American system of federalism in mind. Any attempt to import the system should carefully consider the cultural and governmental system of the country. Also, it should be remembered that part of the effectiveness was that in the partnership the SCS employees and the farmers were for the most part from similar backgrounds with similar values. This was a decided advantage in persuading farmers to use conservation farming techniques. Most SCS employees came from farm families and had earned college degrees in agriculture, or a related field, at the state university.

In other countries the representatives of government and local groups may not necessarily be of the same class or ethnic group. Conservation did not escape from the heritage of colonialism with a particularly appealing reputation among indigenous peoples. In some cases their recollection of "conservation" involved thoughts of the expropriation of the most valuable lands for white farmers and then the imposition of onerous rule for natives farming the poorer, steeper, more erodible lands (Stocking, 1985).

But the district concept can be an asset by involving minorities who have not been fully represented in the conservation movement. For example, attempts to work with native Americans have been was fraught with cultural misunderstanding (Kelly, 1985). During the last decade several native American tribes have formed conservation districts and are again cooperating with SCS. The fact that the district is operated by local people empowers them. Since they can assert themselves as decision-makers in the relationship, the potential exists to accomplish more than in a paternalistic relationship.

Finally, valuable as the district concept is, look at it if you will as one piece of the

possible answer to conservation problems, not a panacea. The landscape of conservation is littered with too many simple answers to complicated problems.

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Bennett, Hugh, H. (1881-1960), American Soil Scientist, Soil Conservation Leader, Author

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A native of Anson County, North Carolina, Bennett graduated from the University of North Carolina at Chapel Hill in 1903, and then joined the Bureau of Soils in the U. S. Department of Agriculture. While making soil surveys in the southern United States Bennett became convinced of the threat soil erosion posed to the country's future agricultural productivity. His numerous speeches and articles soon earned him a reputation as the nation's leading advocate of soil conservation, and he was selected to head a temporary New Deal agency, the Soil Erosion Service in the Department of the Interior, in September 1933. On April 27, 1935, President Franklin D. Roosevelt signed the Soil Conservation Act which created the Soil Conservation Service (SCS) in the Department of Agriculture. Bennett set the course of the nation's soil and water conservation programs as the first chief of SCS, a position he held until November 13, 1951.

Bennett came to be regarded as the "father of soil conservation." He was significant in elevating concern about soil erosion from the level of a few disparate voices to a national movement of awareness and commitment. Soil conservation joined forestry and scenic areas as national conservation concerns. His successes are evident in federal laws for soil conservation, a federal Soil Conservation Service, professional organizations, public interests organizations committed to soil and water conservation, and increased emphasis on soil conservation in university curricula.

Bennett accomplished this task at a time when a few dedicated scientists in the Federal government became advocates for their respective causes, promoted federal legislation, and then served as heads of federal agencies they had virtually created. Gifford Pinchot's advocacy of forest conservation and Harvey W. Wiley's fight for pure food and drug legislation parallel Bennett's vision.

Bennett brought several attributes to the task of creating a national awareness of the menace of soil erosion. Before becoming the first head of the Soil Erosion Service, Bennett had already had a 30-year career as a soil scientist, involving extensive periods in the field observing the effects of soil erosion domestically and in several foreign countries. Gullies were obvious to the casual observer, but Bennett publicized the danger of sheet erosion, a process in which an almost imperceptible layer of soil is removed from the field. Thus, Bennett had scientific credentials and credibility to reach a national audience.

As a scientist Bennett wrote for professional journals. After commencing his crusade for soil conservation, he wrote for magazines with a wider, and sometimes more influential audience. If not as eloquent as some of the naturalist writers, he wrote clearly and with commitment about his cause. While Bennett, the publicist, recognized the need to reach the general public through the popular press, it was, nonetheless, a government publication which became his best known article, *Soil Erosion A National Menace*, USDA Circular 33. Co-authored with William R. Chapline, this piece provided a general survey of erosion conditions which was used in securing legislative support for a national program of soil conservation.

Bennett had obvious political skills and was a master at seizing the opportune moment. He successfully lobbied for funds in 1929 for a series of soil erosion experiment stations and then supervised their work. When

it became obvious that there would be funds for soil conservation work, he pushed his ideas and his candidacy to head up the work. His sense of the dramatic was on display during the Senate Public Lands Committee hearings on the Soil Conservation Act in April 1935. Realizing that a great dust storm from the Great Plains was blowing eastward, he used its sky-darkening arrival to dramatize the cause of soil conservation and win approval for the legislation creating the Soil Conservation Service.

Finally the most valuable element of Bennett's character was his passion for his crusade. As a long-time colleague remarked, he loved to carry the message. He spoke with a fervor that impressed politicians on Capitol Hill, scientists at the Cosmos Club, or farmers on the courthouse square alike.

After elevating soil to a national concern and securing legislation for a permanent commitment to its conservation, Bennett made several decisions, contributions, that influenced national soil conservation programs, especially the Soil Conservation Service, for decades. He recognized the complex causes of soil erosion and insisted that numerous disciplines be involved in devising solutions. Bennett did not believe in panaceas, but thought that the solution to a complex problem should rely on the analytical contributions from several physical and biological sciences including agronomy, biology, forestry, engineering, range management, soil science, and other disciplines. SCS recruited from all these fields and then devised training courses to give the field staff broader training in a variety of disciplines. Bennett also insisted that SCS should work directly with farmers on conservation measures rather than simply disseminate information. Plans for conservation work on the farm should be designed specifically for that farm and be based on the capability of the land. The personal contact has made programs more effective and created as a source of political support for conservation programs.

The viability of soil and water conservation as national concerns was further assured by the creation of the Soil Conservation Society of America (now the Soil and Water Conservation Society) and The Friends of the Land. Though not solely responsible for either organization, Bennett was an influential founding member of both groups. The former group, made up largely of people personally involved in the field of soil conservation, published the *Journal of Soil and Water Conservation.* The latter group drew members from diverse backgrounds who were concerned with conservation issues. Friends of the Land published a well-written, at times eloquent magazine, *The Land*, whose authors came from diverse fields in business, science, literature, and other areas.

Hugh Hammond Bennett is buried in Arlington National Cemetery, Arlington, Virginia.

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He Loved to Carry the Message

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by Douglas Helms,
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The problem of soil erosion in the 1920s and 1930s had an impact on our entire nation. But it was largely the effort of one man that brought the problem to national attention and inspired the creation of the Soil Conservation Service, an agency of the United States Department of Agriculture (USDA). That man was Hugh Hammond Bennett.

Bennett was born near Wadesboro, North Carolina, on April 15, 1881. He grew up in an area along Brown Creek where soil erosion was a constant problem for farmers. As a young man he watched his own father build terraces in the effort to reduce erosion.

After earning a degree in chemistry at the University of North Carolina at Chapel Hill in 1903, Bennett moved to Washington, D.C., to work for the USDA Bureau of Soils. Although he was hired to analyze soils in the laboratory, he soon switched to a job as a surveyor in the USDA's soil survey program. The surveys produced in the program were (and still are) used to help farmers decide which crops to grow on their farms and what fertilizers to apply.

The work of the soil surveyor in the early 1900s was indeed arduous--lugging heavy surveying equipment without the benefit of automobiles, digging hundreds of holes to collect soil samples, calling on generous farmers for a night's lodging. While going about his work in Tennessee, North Carolina, and Virginia, Bennett saw huge gullies that had been created by large-scale erosion. He also became aware of another type of erosion that was not obvious to the average observer. On some hillside fields, a thin layer of topsoil was washed away with each rain. This process he called "sheet erosion." Sheet erosion drained soil of the nutrients that enabled it to produce healthy crops. Although the erosion itself was not always obvious in the fields, its devastating effect on farm families was obvious in the homes where Bennett stayed overnight.

Bennett continued work as a soil scientist in the USDA into the 1930s. His position as head of soil surveys in the South and his writings in scientific journals and other publications brought him an international reputation. Yet he was frustrated that soil conservation was being neglected.

Clamor for forest conservation had resulted in the creation of the National Forest and National Park systems, but the need for conservation on American farmlands was ignored. Bennett decided that if no one else would make soil conservation a national issue, then he would have to do it. He began to write articles for the popular magazines of the day--not scholarly writings for his fellow scientists but articles for magazines that would arrive in the mailbox of the average American home.

Probably the most influential of Bennett's writings was a USDA publication, *Soil Erosion: A National Menace.* Bennett and his co-author, W. R. Chapline, estimated that 500 million tons of soil flowed to the sea each year. They also believed that another billion tons was deposited in locations such as reservoirs and streams. In 1928, in response to the publication, Bennett's influence, and other factors, the Congress provided money for a group of experiment stations to research the means of conserving soil on agricultural lands. It was a beginning.

The research was a valuable and necessary step, but Bennett still wanted a national plan of action. The tragedy of high

unemployment that came with the Great Depression of the 1930s provided the opportunity for such a plan. On August 25, 1933, five million dollars was made available for soil conservation work. Because of his reputation as an expert in the field, Bennett was selected in September 1933 to head the newly established Soil Erosion Service. He decided to start a series of demonstration projects on some of the nation's most eroded farmlands. Workers from the Civilian Conservation Corps and Works Projects Administration--two programs that created jobs for the unemployed--would do much of the work. They would be aided by farmers, who also contributed labor and equipment.

Through demonstration projects, Bennett put his ideas to the test. He knew there would be no single or simple solution to soil conservation problems. Engineers, soil scientists, foresters, biologists, hydrologists, and others would all contribute to the effort, and each farm would have its own conservation plan.

Bennett also believed in using each area of land according to its soil characteristics and slope. If an area could not be used as cropland without erosion, then perhaps it should be used for pasture, or woodland, or for something else. In this way, Bennett hoped to make it possible to use the land indefinitely without damaging its ability to produce.

Bennett won another victory in his campaign on April 27, 1935, when Congress passed the Soil Conservation Act. That act established the Soil Conservation Service (SCS) with Bennett as the Chief. Bennett's demonstration projects had been successful, but it was the Dust Bowl that convinced Congress of the need for the SCS. Eastward winds blew soil from the prairie states of Kansas and Colorado all the way to the Atlantic Coast in the early 1930s, and awakened the American public to the effects of drought and wind erosion on the people of the Great Plains.

As the need arose to spread soil conservation outside the demonstration project areas, officials in the USDA decided they could best solve problems if they worked through conservation districts. Under this arrangement, the Soil Conservation Service would provide people trained in soil conservation to the conservation districts. A locally elected board of supervisors would direct the conservation programs for the area. The Brown Creek Soil Conservation District, including the Bennett family farm, became the first district to sign a cooperative agreement with SCS on August 4, 1937. Today 2,932 conservation districts around the country include more than two billion acres. More than one billion acres of this land is farmland.

Bennett continued as Chief of the SCS until November 13, 1951. He died on July 7, 1960.

Bennett's work as a soil surveyor was often solitary and his fellow workers thought him shy. But his vision and work resulted in important changes. His zeal for soil conservation led him to become a rousing, inspiring speaker to Congress, fellow workers, and the American public. As one colleague recalled, "He loved to carry the message."

Walter Lowdermilk's Journey: Forester to Land Conservationist

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This paper was given at "History of Sustained-Yield Forestry: A Symposium," at the Western Forestry Center in Portland, Oregon, on October 18-19, 1983, coordinated by the Forest History Society for the International Union of Forestry Research Organizations (IUFRO) Forest Group (S6.07). The proceedings, edited by Harold K. Steen under the same title, were published by the Forest History Society, 109 Coral Street, Santa Cruz, CA 95060 in 1984.

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Walter Clay Lowdermilk often described his profession as reading "the records which farmers, nations, and civilizations have written in the land." Few others have belonged to this profession. Certainly few had the inclination, ability, and opportunity to indulge in it as did Lowdermilk. The profession required expertise in many fields of study, but as practiced by Lowdermilk it was not a purely academic exercise. Rather he sought an ambitious objective--a permanent agriculture for the world. Through an understanding of human activities in the past and the earth's response, he hoped to "find the basis for a lasting adjustment of human populations to the Earth."[1]

Lowdermilk became a member of the early twentieth century conservation movement in the United States, a movement with a strong scientific bent.[2] The scientists held that treatment of natural resources should be in accordance with scientific principles, not propelled by emotionalism or untested theories. Lowdermilk's inquisitiveness, intellect, and foreign travel took him on an unusual professional journey. Veering from forestry, he circled the field of land conservation--a field encompassing several sciences and disciplines. In foreign travels Lowdermilk found situations where people's relationship with the land had reached a precarious balance, or an imbalance resulting in famines. Coping with these situations required an integration of knowledge from science, technology, and engineering. Other scientists in the movement had not embraced a multidisciplinary approach. The abundance of natural resources in the United States, and the low population density, had allowed scientists of his era to view solutions to resource problems as a set of discrete alternatives--a view which further entrenched their fealty to their chosen disciplines.

Walter Lowdermilk was born on July 1, 1888, in North Carolina, but spent his childhood at numerous points westward during the family's extended migration to Arizona. As a college student at the University of Arizona, he realized his dream of earning a Rhodes scholarship. The curriculum at Oxford permitted him time to study forestry in Germany. Herbert Hoover's Commission for Relief in Belgium called Lowdermilk and other young Americans in Europe to interrupt their studies. After the scholarship years, he served as a ranger in the Southwest for the Forest Service. Returning from World War I, he became the Forest Service's regional research officer in Montana.[3]

A man who enjoyed research work, he had found a position that offered satisfaction. Given his ability, there was opportunity for advancement. But he was not to remain on that career ladder. Soon he would be in China, where, he later recalled, the "full and fateful significance of soil erosion was burned into my consciousness."[4]

Through the years in England and afterward, the young forester had corresponded with Miss Inez Marks, a friend from Arizona. On leave from her missionary work with the Methodist Church in China, she agreed to meet him at the Rose Bowl, New Year's Day, 1922. Marriage plans quickly

followed. Her entreaties that China desperately needed talented scientists led to his applying for a position with the University of Nanking's school of agriculture and forestry. The couple married in August and departed for China in September 1922. Lowdermilk's charge, for a small salary, was to assist in solving the flooding problems and resulting famines. Exactly how a forester was to help with food production remained a mystery as he attended university classes to learn Mandarin during the first year.[5]

An expedition to the Yellow River solved the mystery. There he stood atop a section of the 400-mile-long dike that held the river 40 to 50 feet above the flood plain. This marvel was a result of Chinese labor necessitated by silting of the river's channel--aggradation in the terms of earth scientists.

Lowdermilk set out to find the source of the silt.[6] In spring 1924, O.J. Todd, engineer of the International Famine Relief Commission, accompanied Lowdermilk on a two-thousand-mile trip on the watersheds of the Yellow and Wei rivers. Todd's mission was to study the Wei-Peh irrigation project. Few foreigners had visited the area of northwest China where the pair completed a third of the journey afoot or on mulecart or muleback. In Shensi province, they found a plateau consisting of deep, undulated deposits of loessial soils. Depth, fertility, and erodibility made these fine, wind-deposited soils prime locations for man-induced erosion. In the deforesting activities of the people Lowdermilk found the reason for the gigantic six-hundred-foot-deep gullies, "So great is the demand for fuel and wood that the mountainsides are annually shaved clean of all herbaceous shrub and tree growth."[7] Paradoxes abounded on the trip. Temple forests, reproduced naturally and protected by Buddhist priests, provided evidence of the denuded hills' capability for sustaining vegetation. Bench terraces festooned some slopes. Yet some of the best agricultural land on the level, alluvial plains was used for timber production under irrigation. Surrounding hills were little used for timber.

The pair visited Sianfu, the capital city of China during its Golden Age, where Todd wanted to inspect the irrigation works. The area retained little of its former prosperity, which Lowdermilk conjectured had flowed from a great irrigation project which was now "silted up and out of use." The forester returned to his post at the University of Nanking with an impression of "colossal erosion" contrasted with "evidences of former grandeur." Already he had decided to expand his study of the sciences involved with natural resources to include the actions of people as well. The trip had provided "abundant material for an entrancing study of man's relationship to nature."[8]

Historical research revealed that the Yellow River had changed course eight times since A.D. 11. Several times the river had been restrained by dikes only to break free. Once it emerged four hundred miles from its former outlet. Dikes, therefore, were essential to using the plain for agriculture. But building higher dikes, Lowdermilk concluded, was not a lasting solution unless the aggradation of the river was reduced by checking the supply of silt.[9] Lowdermilk's supposition that erosion caused frequent and severe flooding had been recognized in the United States, but only on the small water courses, not on the lower reaches of major rivers. The China experience--siltation of a major river channel as a cause of flooding and channel relocation--was on a scale unknown in the United States.

Lowdermilk's recommendation for flood control gave some indication of the breadth of his training in sciences, especially geology, and his ability to assimilate the findings into a solution. The Yellow River and her tributaries had excavated a deep channel into the plateau created by the wind-deposited soils. Recognizing that removal of vegetation allowed runoff to carve gullies in the loessial plain and that gully wash accounted for most of the silt, he proposed attacking erosion by planting trees on the talus slopes at the foot of the gullies. The forested gullies would be

guarded and managed by villages as community forests to provide wood. Undissected portions of the loessial plateau could be used for agriculture. Where and when possible, check dams should be used to raise the base level of streams and prevent incision by the gullies farther into the plateau.[10] Treatment of the watershed was directly tied to famine prevention. He concluded that soil and water conservation were urgently necessary to increase the productivity of this region of China.[11]

Lowdermilk was not content to base his recommendations exclusively on empirical evidence. Certainly the scientific forestry school, whence he came, demanded another explanation. Using the runoff and erosion plot study method devised by F.L. Duley and M.F. Miller at the University of Missouri, he and his Chinese associates set up plots on twenty temple forests and on denuded areas for comparison. After three years of study, he presented the findings. Runoff from denuded areas greatly exceeded that of temple forests or areas reclaimed through reforestation. The main reason for the excess runoff, he believed, was that particles of soil on the denuded areas clogged the pores of the soil surface. Forest litter arrested this action.[12]

Further study convinced Lowdermilk that forty to sixty percent of the uplands in northern China had little cover to retain runoff. So great had been the rapid runoff that it had reduced evaporation and brought on a period of decreased precipitation in the area. With this argument, Lowdermilk projected a hypothesis that he would later apply to other lands. Scholars had long been presented with anomalies of twentieth century poverty contrasted with evidences of former civilizations which possessed a high degree of culture and prosperity. Some scholars, notably Ellsworth Huntington and Baron Von Richthofen, found the answer in climatic change. In the case of north China, Lowdermilk not only saw soil erosion and flooding as the reason for decline, but also claimed their effects as the reason for a climatic change.[13]

The communist uprising of March 24, 1927, in Nanking ended the Lowdermilks' stay in China. Leaving behind all possessions, they barely escaped. At the University of California, he combined study for a Ph.D. from the School of Forestry (minors in soil science and geology) with research at the California Forest Experiment Station. Here he reentered the fray over the effects of vegetative cover on runoff, erosion, and flooding. On one of his treks in China, Lowdermilk had heard the proverb, "Mountains empty--rivers gorged." He judged the application of timber management in that locale to be superior to any system he had observed in Germany.[14] The Chinese and other civilizations had recognized the value of forest cover and acted upon their observations. Scientists in the conservation movement demanded more than proverbs for proof, and the influence of forest cover on soil erosion and streamflow had been warmly debated by hydrologists, engineers, and foresters.

In the United States, the advocates of scientific forestry on public lands, who emphasized a sustained supply of forest products as the major benefit of public ownership, received support from irrigation farmers who needed an assured supply of water--water that was free of ditch-clogging silt. In their support of watershed protection they relied on observation, and were undeterred by the absence of scientific proof. Lines of inquiry into watershed treatment resulted not only from the inquisitiveness of the scientist's mind but also from these public policy questions. Legislation for forest reserves, upstream reservoirs for flood control, and comprehensive water development programs touched off research by the government agencies affected. The research results could seriously alter their project plans and budgets.[15]

Lowdermilk believed that builders of large engineering works downstream should provide for soil erosion control in the catchment areas, as a portion of the project's benefits was attributable to watershed management. The value of watershed management, however, had not been

satisfactorily measured and described. A review of the literature convinced Lowdermilk that most watershed studies which tried to measure the influence of one factor on runflow were flawed. In an open setting there were too many variables which were observed, not measured. He must create a laboratory type experiment which would isolate the factors, measure them, and explain the processes.[16]

In his study of the influence of forest litter on runoff and erosion, he used rainmaking machines, soil profiles transferred to tanks, and measuring instruments of his design. In 1929, he presented the confirmation for what he and others had observed. On bared soil the raindrops splashed up muddy. As muddy water percolated into the soil profiles, "fine suspended particles were filtered out at the soil surface."[17] The thin layer thus formed reduced percolation and increased runoff. The water-absorbing capacity of forest litter had little influence on runoff. However, by keeping the water clean, the litter maintained the soil profile open to percolation. The experiments confirmed a hypothesis that Lowdermilk had first presented at the Third Pan-Pacific Science Congress in 1926 at Tokyo.

Lowdermilk did not elaborate on the implications of his research. Perhaps this omission was in keeping with the accepted method of presenting the results, but the value to soil conservation was obvious. If forest litter served not as an absorber of water, but as a buffer between the raindrop and the ground, then any vegetative land cover could be valuable for soil erosion control. Pastures, hay crops, any close growing crop, or crop residues could serve as barriers to the erosion process.

As Lowdermilk pioneered in the field of reading records written in the land and applied scientific explanations, he needed new terminology. At the Stockholm meeting he seized the occasion to introduce two terms for the conservationist's lexicon. "Accelerated erosion" arose from the "artificial disturbance of factors which controlled the development of soil profiles." In the absence of such disturbances, one could view any erosion as the "geologic norm of erosion."[18]

Back in California, Lowdermilk set about measuring the other factors in runoff and erosion that would provide a "basis for enlightened management of watershed areas."[19] Experiments focused on elements of the hydrologic cycle: precipitation, temperature, evaporation, runoff, infiltration, percolation, and transpiration. The Agricultural Appropriations Act of 1929 provided funds to U.S. Department of Agriculture agencies for erosion and runoff experiments. The research program made it possible to establish experiments on a large, isolated watershed. The San Dimas watershed of southern California provided an excellent opportunity to test the effects of watershed management on water yield. Expanding towns and citrus orchardists at the foot of the watershed had to dig increasingly deeper wells to reach underground aquifers. Whether the vegetative mantle should be burned to reduce transpiration or protected from fire for maximum ground water supplies was a matter of controversy. To demonstrate and measure the relationship of percolation to aquifer levels Lowdermilk had Civilian Conservation Corps enrollees build water spreading structures which led to a gravelly basin where the silt settled out and water percolated to the aquifers.[20]

Though Lowdermilk had devised the research plan for San Dimas and supervised the early work, he was not destined to see it to completion. Events and foreign travel again intervened to set Lowdermilk back on the path to land conservationist. When the Soil Erosion Service was established in 1933, Assistant Secretary of Agriculture Rexford Tugwell, who had toured the California experiments, insisted that Lowdermilk serve as Assistant Chief to Hugh Hammond Bennett.[21] Their personalities differed greatly, but on the matter of conserving farmland there were points of agreement. Bennett, like Lowdermilk, emphasized that conservation was not exclusively a matter of maintaining fertility on hillside soils. Lowdermilk had seen the effects on the Yellow River flood plain.

Bennett, as an inspector of soil surveys in the South, had seen the same effects on a smaller scale in flood plains of the South where sand, and eventually gravel, piled up on flood plains. Looking at the situation in strictly agricultural terms, the use of erosion-inducing farming practices on some of the least valuable lands was preempting the most valuable from food production.[22] Thus, they held the belief that conservation should be applied not just to the individual farm, but to an entire watershed.

Both men also viewed the coordinated use of vegetal and engineering measures on the individual farm as necessary for soil conservation. Lowdermilk, the forester, realized that erosion control in a country such as China with famine problems could not be achieved strictly by vegetal control. Bennett had obtained his conservation experience in the South, where the broad-based channel terrace had been invented to contend with erosion problems. He saw the limitations of engineering measures as well as their values. In Central America, he had seen coffee interplanted with bananas, plantains, and other fruit-bearing trees on steep land, where they nonetheless provided excellent erosion control.[23] As an institutional goal, the young Service would attempt to assimilate and coordinate many disciplines into its conservation program. Individually, the Service's field men working on farms should be what Lowdermilk called "land doctors," general practitioners of the conservation sciences.[24]

In addition to working with farmers on watershed-based demonstration projects in critical erosion areas, the Service had a considerable research program which Lowdermilk directed. The experiment stations established under the 1929 Agricultural Appropriations Act were already engaged in research on terracing, crop rotations, stripcropping, tillage methods, and their value to soil conservation. Lowdermilk added runoff and erosion studies that included the collection of hydrologic, climatic, physiographic, erosion history, and sedimentation data. While these fifty-year long watershed studies were to be comprehensive, particular aspects were related to debates among scientists and government agencies. The bedload studies involved the degree of sediment sorting by stream action and the amounts deposited in stream channels. In a practical way, the studies countered the accepted method of measuring erosion from a watershed by simply measuring the silt emerging at the watershed's lower end.[25]

In 1938 chance again intervened in Lowdermilk's life. As usual, he seized the opportunity. Representative Clarence Cannon suggested that a survey of the Old World could be useful in the United States' efforts toward a permanent agriculture. The trip, August 1938 to November 1939, involved more than twenty-five thousand miles of automobile travel in Europe, the Mediterranean area, and the Middle East. Here he perfected his art of reading the land for evidence of past use and misuse. Before undertaking surveys in each country, Lowdermilk consulted agriculturalists, scientists, and officials. Geologists and archaeologists were especially interested, and valuable to Lowdermilk in explaining the cultural and physical factors involved in land use. In addition to searching for soil conservation and flood prevention measures that might be imported to the United States, Lowdermilk was engaged in what he called "agricultural archaeology." Ruins of some pre-industrial civilizations indicated a prosperous agriculture, although these areas now had serious resource problems. What events brought about such conditions? What were the lessons for contemporary civilizations?[26]

Lowdermilk's land-read records of past civilizations appeared in numerous articles. Indeed, there were "Lessons From the Old World to the Americas in Land Use," as Lowdermilk titled an article in the annual report of the Smithsonian Institution. He gladly noted the cases of wise land use through centuries, but was usually obliged to find a story of deterioration.[27] The Soil Conservation Service published a summary, *Conquest of the Land Through 7,000 Years*, in 1953 and followed it with several reprintings until more than one million copies were distributed. Readers who know

Lowdermilk only through this publication have perhaps a truncated view--that of the globe-trotting chronicler of calamities awaiting civilizations that abuse their resources. He realized that a civilization's decline could not be interpreted solely on the basis of soil erosion. However, in writing the pamphlet, he embarked on a didactic mission aimed at all Americans, not just farmers. Soil fertility was a matter of concern for the farmer. Maintaining the medium for fertility--the physical body of soil resources--concerned the nation. Without it, "liberty of choice and action" was gone.[28]

World War II terminated the trip in Europe but it opened a new opportunity, a return to China. At the behest of the Chinese government, Lowdermilk undertook the dangerous journey to advise the Chinese about increasing their food supply. During the intervening years in the United States, he had continued to study the agricultural archaeology of China. While in China he bought gazetteers, local histories, which Dean R. Wickes, a Chinese language specialist, then researched for evidences of erosion problems. This research showed that in northern China, an area with a small percentage of level land, the population had increased threefold since the mid-eighteenth century. This rapid population increase sent people to the hills for firewood and arable land, without any orderly installation of engineering measures for soil conservation. Unlike areas of central and southern China, they had no elaborate bench terraces to protect farmland. The gazetteers provided accounts of clearing the slopes, removing farmland from the tax rolls as wasteland, and abandoning homes along streams due to frequent flooding.

The forester turned historian found an impressive case for the effects of erosion on agricultural productivity in the Wei-Peh irrigation system along the Wei River. Begun at least as early as 246 B.C., the system had irrigated 400,000 acres. According to Lowdermilk's research, the area became prosperous and dominated the surrounding territories. A Chinese chronicler believed the reason for prominence lay in the assured food supply: "Thereupon Kuanchung became fertile territory without bad years; whereupon Ch'in became rich and powerful and finally conquered the feudal princes." The Chinese remade the irrigation system eleven times during twenty centuries in their never-ceasing battle with silt. Piles of excavated silt thirty-five feet high lay on the canal banks in the fourteenth century. Usually they preferred digging new canals to clearing out sediment. During the eighteenth century, while the Chinese labored ceaselessly at keeping the canals open, the irrigated acreage was only one-tenth its original size. American engineers, under the direction of Lowdermilk's old traveling companion O.J. Todd, used modern equipment and reinforced concrete to rebuild the project. Even with modern equipment the problems remained, because water entering canals following heavy rains in 1931-32 measured 46 percent silt by weight. The irrigation farmer in China, like his counterpart in the Western United States, had to look to watershed protection as a source of silt-free water.[29]

Controlling erosion on the upper reaches of watersheds became a passion for Lowdermilk's generation of conservationists. They favored land cover for increased absorption and engineering works for the controlled disposal of water without erosion. The upstream reservoir on the small watersheds was an integral part of the river development--an assertion that was often contested. Proponents of the control and use of headwaters had stated their case in the publications *Little Waters* and *Headwaters: Control and Use.*[30] In the later 1940s they had another opportunity when Morris Cooke, a force behind *Little Waters*, became chairman of the President's Water Resources Policy Commission. Lowdermilk assumed chairmanship of the Committee on Standards for Basic Data. The Cooke and Lowdermilk views held sway in the committee report that emphasized a comprehensive, interdisciplinary approach. The interdependence of land and water called for watershed management which had been neglected due to "our natural endowment and relatively low population density."

Furthermore, the small watershed, the unit of watershed management preferred by the authors, was a cultural unit. The watershed unit had to be small enough so that residents understood its influence on their lives. Then they would devote the time and money needed to bring it to fruition as a community watershed. Lowdermilk's experience in semi-arid climates came through in the committee's attitude toward flood control. Where feasible, reservoirs should not be used solely to control floods, but also to store storm waters for later use.[31]

The attitude toward reservoirs and engineering works illustrated, as did other beliefs, the length of Lowdermilk's professional journey from forestry. He had come to believe that the earth had to be prepared to accept the benefits of rain. In his system of "physiographic engineering," reservoirs could be designed to perform functions other than storing water and controlling floods. For example, reservoirs could create intermediate base levels of stream cutting which reduced head cutting of tributaries. Downstream, the clear water flowing from a reservoir could excavate alluvial fill in a channel and reduce the frequency of flooding.[32]

As a man of many sciences, Lowdermilk also became a man of many reputations. Most Americans knew him from his call to heed the lessons of the Old World in conserving soil resources. Archaeologists and historians searched the physical and documentary remains of civilizations for refutation or confirmation of his land reading expertise. In the international scientific community his reputation rested on the hydrologic studies. The Chinese and Israelis recalled his humanitarian activities to increase food production.

Lowdermilk's experience in Israel illustrated that facility in physical sciences which allowed him to interpret past land use patterns also made him a master at proposing measures for increased food production. During the trip to the Middle East in 1938-1939, Lowdermilk became inspired by the efforts of urban-born European Jews to reclaim land. Upon returning to the United States, he wrote *Palestine: Land of Promise*, which proclaimed that the land could once again support a large population. After retirement from the Soil Conservation Service he worked with the Israelis to implement some of the measures outlined in the book. Many Israelis favored technical assistance for agricultural development over direct food assistance. That sentiment was concisely conveyed when Minister of Development Mordecai Bentov coined the saying, "We don't need powdered milk; we need Lowdermilk."[33] While there, Lowdermilk helped establish at Haifa a school to train conservationists, a school which later bore his name. The Lowdermilk School of Agricultural Engineering emphasized the basic sciences as preparatory to agricultural studies. Students took two years of mathematics, chemistry, physics, geology, and biology before moving on to the agricultural sciences. A job-related project in the fifth year was necessary to earn the degree.[34]

The fifth year requirement of field experience reflected the Lowdermilk experience. He believed that field work was a necessary component of research. In the Soil Conservation Service, field personnel were to be encouraged to suggest alternative ways of accomplishing conservation objectives. Field work, especially in an area such as China, where farming had been practiced for centuries, could uncover useful information. There was always the possibility that "some unheralded genius may have already found the solution to our problem, a solution in whole or in part if we know what we are looking for."[35] After all, it was in the field, on the Yellow River, that Lowdermilk's career as a land conservationist began.

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33 Conversation with Abraham Avidor, Foreign Agricultural Service, U.S. Department of Agriculture, December 2, 1983. Richard D. Siegel, Deputy Assistant Secretary, U.S. Department of Agriculture, brought this saying to my attention and Mr. Avidor, who grew up on a kibbutz and who knew Mr. Bentov supplied the details. Bentov was seeking to promote the development of agriculture and viewed the direct food assistance as an inhibiting factor. Avidor reports that the saying was quite prevalent in Israel in the 1950s.

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The Civilian Conservation Corps: Demonstrating the Value of Soil Conservation

A public works program of the depression-ridden 1930s became a godsend to Hugh Bennett in his attempt to show how land might be farmed within its capabilities.

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Most conservationists are familiar with the contributions the Civilian Conservation Corps (CCC) made to forestry and recreational projects for the established conservation agencies of the 1930s, the Forest Service and National Park Service. But other agencies or their predecessors, such as the Fish and Wildlife Service, Bureau of Reclamation, Bureau of Land Management, and Soil Conservation Service (SCS), also made use of CCC labor. For example, CCC work enabled SCS to demonstrate the value of conservation activities. The federal role in soil and water conservation, therefore, did not end after the Great Depression and the termination of emergency employment programs.

Today, the CCC is the beneficiary of a positive public reputation that has obscured the history of problems that any large organization of individuals almost necessarily has. But that is not our story for now; it is the CCC's contribution to the cause of conservation.

Putting young men to work

In 1932, one-fourth of America's men between the ages of 15 and 24 could not find work. Another 29 percent worked only part-time (8). Incoming president Franklin D. Roosevelt proposed on March 21, 1933, that Congress create "a civilian conservation corps to be used in simple work, not interfering with normal employment, and confining itself to forestry, the prevention of soil erosion, flood control and similar projects."

Congressional deliberations resulted in several alterations to Roosevelt's proposal, one of which held great significance for the future course of soil conservation. Major Robert Y. Stuart, chief of the Forest Service, asked that state and private land be made eligible as work areas. Otherwise, men from the East would have to be transported west of the Rocky Mountains, where 95 percent of the public domain lay (8). Stuart's argument was persuasive in part. The Act for the Relief of Unemployment allowed soil erosion control work on state and federal land, but restricted work on private land to activities already authorized under U.S. laws, such as controlling fire, disease, and pests in forests and "such work as is necessary in the public interest to control floods." The future of CCC work in soil conservation on private land henceforth depended on interpreting provisions of the act.

On the day Roosevelt signed the bill, Secretary of Agriculture Henry A. Wallace wired each governor to send a representative to Washington to discuss cooperation on forestry work. He also mentioned the flood control work and surmised that it "probably [included] control of soil erosion."

But soil conservation work was to be severely circumscribed. In April a U.S. Department of Agriculture (USDA) representative met with Roosevelt, who wanted CCC work on erosion and flood control directed to solving flooding problems over broad areas rather than benefiting an individual parcel of land. CCC Director Robert Fechner reiterated the president's reservations about work on private land to the governors in May.

Concern about the public's objections to expenditures of federal funds on private

lands caused some of Roosevelt's reservations. He continued to warn Fechner about the criticism that too much work on private land would bring (3, 4). Also, Roosevelt, like many of his contemporaries, too often thought soil conservation required land use changes from cropland to woodland and was unfamiliar with the many conservation practices that could be installed on cropland with CCC labor. But he also had to heed the calls for a full share of CCC camps in those states where the acreage of public land was small. Thus, Roosevelt asked Fechner and Wallace to grant requests from midwestern states for soil erosion control camps.

Within USDA, the Forest Service administered the erosion camps similarly to its state and private forestry work. Under signed agreements with states, personnel from state agencies and land grant colleges actually operated the camps. CCC efforts followed soil erosion control guidelines established by USDA that limited work to "controlling gullies by means of soil-saving dams, forest planting and vegetation." Gradually the concept was extended to include construction of terrace outlets.

The first soil erosion control camp under Forest Service and state control opened in Clayton County, Alabama, on June 18, 1933. By September 1934, there were 161 such camps.

There the matter of the so-called soil erosion camps rested until August 25, 1933. Then Secretary of Labor Harold Ickes, also acting in his dual role as administrator of the public works, allotted $5 million for soil conservation work under the National Industrial Recovery Act of June 16, 1933. On September 19, 1933, a USDA soil scientist, Hugh Hammond Bennett, the country's acknowledged expert on soil conservation, moved to the Department of the Interior as head of the newly formed Soil Erosion Service (SES). The soil erosion camp guidelines then in effect hardly fit the SES director's notions of soil conservation.

To Bennett's thinking, erosion had to be reduced through a coordinated effort that allowed farmers to continue farming without reducing income. Land that was too steep and erodible would have to be converted to pastureland or woodland to provide groundcover throughout the year. On cultivated land a mixture of interdependent and mutually supportive structural and vegetative practices needed to be tailored to the needs of each farm and farmer. Bennett's years of observation had taught him to be wary of single-method approaches that could create new problems while mitigating existing ones.

Bennett's approach did not require drastic changes in the crops that farmers grew. But his ideas about farming land according to its capabilities did entail rearrangement of fields to follow contour lines, changes in planting methods, and use of cover crops. It would have been difficult enough to sell the new conservation farming system without asking farmers, during the depth of the Depression, to borrow money for seed, fertilizer, equipment, and labor to install terraces, waterways, and fences and to improve pastures. Furthermore, Bennett wanted to demonstrate the values of conservation on an area larger than the individual farm--demonstration projects of watershed size where the concentration of CCC labor would be ideal.

SES encountered difficulty acquiring camps, however, especially because soil conservation, in the eyes of the CCC administrators, was being attended to in USDA. Nonetheless, CCC allotted 22 camps, less than half the number requested, to SES in April 1934.

Linking the two pieces of legislation--the CCC act and employment act under which SES operated--permitted Bennett to implement his coordinated, comprehensive plans for conservation farming. Money from the public works appropriation bought the supplies, while CCC supplied the labor. The solicitor of the U.S. Department of the Interior ruled that the public works money could be used for work on private land, as proposed by Bennett. The restrictions on CCC work in soil conservation largely were reinterpreted.

Coon Valley leads the way

In May 1934, Fred Morrell, in charge of CCC work for the Forest Service, visited Coon Valley, Wisconsin, which was destined to become one of the most successful demonstration projects. There he found Ray Davis, director of the project, ready to use the "camps to further any and all parts of their program...to demonstrate proper farm management to control sheet erosion." What Bennett and Davis had in mind for Coon Valley and other areas went far beyond simply plugging gullies, planting trees, and building terrace outlets.

The Coon Valley project, characterized by the narrow, steep valleys of southwestern Wisconsin's Driftless area, illustrated how Bennett and the CCC broadened the scope of soil conservation activities. Through the winter of 1933-1934, erosion specialists on Davis' staff contacted farmers to arrange five-year cooperative agreements. Many of the agreements obligated SES to supply CCC labor as well as fertilizer, lime, and seed. Farmers agreed to follow recommendations for stripcropping, crop rotations, rearrangement of fields, and conversion of steep cropland to pasture or woodland. Alfalfa was a major element in the stripcropping. Farmers were interested in alfalfa, but the cost of seed, fertilizer, and lime to establish plantings had been a problem during the Depression (13).

Another key erosion-reducing strategy was increasing the soil's water-absorbing capacity by lengthening the crop rotation and keeping the hay in stripcropping in place longer. A typical three-year rotation had been corn, small grain, then hay (timothy and red clover). Conservationists advised farmers to follow a four- to six-year rotation of corn, small grain, and hay (alfalfa mixed with clover or timothy) for two to four years.

Grazing of woodlands had contributed to increased cropland erosion. Trampling soil and stripping groundcover reduced the forest's capacity to hold rainfall and increased erosion on fields downslope. Moreover, grazing slowed the growth of trees while providing little feed for cows. Most of the cooperative agreements provided that the woodlands would not be grazed if CCC crews fenced them off and planted seedlings where needed.

SES also tried to control gullying, especially when gullies hindered farming operations.

Streambank erosion presented another problem. While the conservation measures on cropland would ultimately reduce sediment flowing into Coon Creek, streambank erosion was still a problem. The young CCC'ers built wing dams, laid willow matting, and planted willows.

In the area of wildlife enhancement, workers established some feeding stations to carry birds through winter. But generally the schemes to increase wildlife populations were of a more enduring nature. Gullies and out-of-the-way places that could not be farmed conveniently served as prime wildlife planting areas. Some farmers agreed to plant hedges for wildlife that also served as permanent guides to contour stripcropping. Insofar as possible, trees selected for reforested areas were also ones that provided good wildlife habitat (13).

Between the fall of 1933 and June 1935, 418 of the valley's 800 farmers signed cooperative agreements. Aerial photographs revealed that long after the demonstration project closed, additional farmers began stripcropping. From Coon Valley, this practice spread during the 1940s, 1950s, and 1960s into adjacent valleys of the Driftless area (15). To James G. Lindley, head of CCC operations for Bennett, this dissemination was the "sincerest form of flattery."

The discrepancy between this program and the more restricted one operating through the states did not go unnoticed. Director Fechner certainly preferred uniformity. The Forest Service had no great enthusiasm for keeping the soil erosion camps, but to turn them over to SES would cause problems with the states. Nor was the Forest Service inclined to broaden its program to resemble Bennett's SES program. After visiting Coon

Valley, the CCC representative for the Forest Service, Fred Morrell, believed that SES was contravening the President's instructions because the "Act [CCC] is apparently a forestry Act."

SCS assumes a greater role

If Roosevelt knew, and he probably did not, that soil erosion had been interpreted so broadly, he certainly did not reprimand anyone. The President appreciated an innovative mind, initiative, and a facility for bending the rules. Bennett received a compliment rather than a scolding. Years afterward, he told and retold the story of being summoned to the White House. Roosevelt explained how he, without detailed knowledge of the program, knew Bennett and his colleagues were doing a good job because established agricultural organizations wanted to absorb the new and as yet temporary agency. According to Roosevelt's political instincts, the desire for conquest was a measure of the quality of the prey.[1]

But Roosevelt did act to unify the programs by moving SES to USDA in March 1935. Bennett and his group's impressive showing were no small part in the President's decision to support and sign the Soil Conservation Act in April 1935. Later that month the newly renamed Soil Conservation Service took over more than 150 CCC camps previously under the general supervision of the Forest Service.

As the Depression continued, SCS assumed a greater role in supervising youth work through CCC. For example, in fiscal year 1937 an average of 70,000 enrollees occupied about 440 camps. Ninety percent of the camps worked not on the watershed-based demonstration projects but in a work area whose radius encompassed about 25,000 acres. As local communities began organizing soil conservation districts and signing cooperative agreements with USDA in 1937, SCS began supplying a CCC camp to further each district's conservation program (11). During the life of CCC, SCS supervised the work of more than 800 of the 4,500 camps. Black enrollees worked in more than 100 of those camps.

The expanded camp program brought CCC crews to new farming areas with a variety of conservation problems. Nonetheless, a majority of camps were located in the prairie states and eastward, especially the areas of row crop farming in hilly areas under humid conditions. The Reconnaissance Erosion Survey of 1934 provided additional guidance on where demonstrations were most needed. The map of CCC camps under the expanded program often coincided with maps of the areas of severe erosion.

In addition to the type of work performed at Coon Valley in a dairying and general farming area, CCC crews also worked with orchardists in the Northeast. There, CCC labor was used as an inducement to get farmers to lay out orchards on the contour, build terraces and provide outlets for established orchards and, most importantly, plant cover crops (9).

An agent of change

Generally, the CCC camps and demonstration projects served as agents for agricultural change. An SCS engineer reported from Columbus, Nebraska, that "the terracing prompted by the camp is the first that has been done in this county." Southern farmers had terraced land for a long time, but feared grassed outlets and waterways as sources of weeds. Thus, camp SCS-2, a black CCC camp at Collierville, Tennessee, received compliments for convincing tenants to accept Bermudagrass outlets and pastures. The project was judged to be the best example of such work in the state. Not one farmer in the Duck Creek Demonstration Project at Lindale, Texas, used Bermudagrass for soil conservation when the project began, but there were 2,138 acres of Bermudagrass a few years later (14). During an era when fertilizer was used sparingly, if at all, on pastures, the labor and supplies available through the CCC made possible a demonstration of the importance of pasture improvement.

As Hugh Benentt's plan to work with nature involved more vegetation, especially on highly erodible areas, there was a great need for planting materials. CCC crews

worked at the nurseries established in conjunction with demonstration projects. Sometimes a CCC camp worked exclusively at a larger nursery. In 1936, after taking over the Bureau of Plant Industry's erosion nurseries, SCS had 48 major nurseries, which produced 130 million trees and seedlings for the CCC work areas and demonstration projects. CCC crews took to the pastures, range, and woods in the same year and collected 664,973 pounds of native grass seed and 1,647,064 pounds of conifer and hardwood seed for nursery stock (10).

Collecting grass seed was also part of the conservation program in semiarid areas, where regeneration of rangeland for grazing often involved CCC work in seeding and fencing for grazing distribution and contour furrowing, developing springs, and building water spreaders and stock water dams for water conservation. Enrollees at Camp SCS-4 near Huron, South Dakota, for instance, spent most of their time in 1938 and 1939 building stockwater ponds. During the life of the SCS-supervised camps, enrollees built 134,167 miles of contour furrows to improve range and reduce erosion.

In areas of small, irrigated farms, work on leaky canals, overuse of water, and control of erosion on steep, irrigated slopes had to be incorporated into the program to attract cooperation. One strength of CCC and SCS leaders was their ability to recognize the need for new work and add it to the conservation program and concept.

Further west the mediterranean climate made the Pacific Coast a prime area for vineyards and orchards. As it did for orchards of the Northeast, SCS promoted contour planting and cover crops. Winter cover crops were particularly important on the Pacific Coast, where much of the rain falls during those months. On the Corralitos Creek Demonstration Project at Watsonville, California, enrollees worked on 29 miles of terraces and grade ditches and constructed 33 major outlet structures.

A public land focus too

CCC work on farms and ranches provided the model for future SCS work with landowners. But CCC and SCS established some of their larger, coordinated projects on federal and state lands. The Rio Grande watershed above Elephant Butte Reservoir in New Mexico included both public and private lands. The reservoir, a Bureau of Reclamation project, had a capacity of 2.6 million acre-feet of water when completed in 1917. In the fall of 1935, SCS began deploying CCC camps to work on conservation measures to slow siltation of the reservoir. By 1937 silt had reduced the reservoir capacity 20 percent.

Enrollees from seven camps worked above the dam, while those from three camps below the dam concentrated on flood control for the towns. Within a year the 10 camps built 14 large impoundment dams and 49 smaller ones for stockwater and flood control, 6 miles of fence, and 900 miles of contour furrows. They dug 123,000 feet of ditches to divert water from gully heads. To further control gullies, they built 30,000 check dams, seeded or sodded 19.6 million square yards on banks, and planted 407,000 trees (1).

Some projects combined flood control for towns with water retention for agricultural uses. Camp SCS-4-N built a 2,400-foot, wire-bound rock diversion structure across Angel Canyon to protect El Rito, New Mexico, from flooding. The water was diverted along a 20,000-foot dike, where waterspreaders carried it to cultivated land and improved pasture.

Camp SCS-25 at Safford, Arizona, developed water spreaders for water infiltration on state lands in the Gila River Valley. Camp SCS-7 at Leeds, Utah, developed levees and dikes and built flood-control devices to protect irrigation systems.

Native American CCC enrollees worked under the auspices of the U.S. Department of the Interior's Indian Service, which carried out the functions of feeding, clothing, and transporting enrollees that the U.S. Army performed for other camps. SCS developed land management plans for several reservations, including the largest SCS work area, the Navajo Project. Along with

other laborers, the Indian CCC workers installed numerous measures from the reservation's conservation plan (5, 6).

Enrollees at camp SCS-7, Warrenton, Oregon, participated in a project that became internationally known to experts on coastal sand dunes. A jetty built at the mouth of the Columbia River in the late 19th century resulted in scouring of the channel bottom. The sand drifted down the coast to be driven inland by strong winds onto the overgrazed sand dunes. This combination of events caused a wide sand flat, often covered by water at high tide. CCC enrollees logged and split fire-killed timber, donated by the county, to build a picket fence along the beach. They then planted European beachgrass on the dune that formed over the picket fence. The work restored the coastal area as a popular recreational site (2, 7).

Cooperative agreements with state highway departments allowed CCC enrollees to work on roadside erosion problems. Before the close of the CCC camps, 841 miles of roadside demonstration projects were completed (12).

To be sure, not all of the ideas for conservation originated with SCS. Local communities and states brought their problems to the attention of SCS and CCC officials. When the CCC program began, the Kansas Forestry, Fish, and Game Commission announced that it wanted to construct a series of lakes in state parks with CCC labor. The commission met objections that large structures were out of the purview of the CCC by agreeing to pay for materials and design work. The Forest Service supervised the work until SCS became part of USDA. The construction of each dam required the fulltime work of a CCC camp. The camps built at least seven lakes larger than 100 acres.

CCC valuable to SCS

In retrospect, the material accomplishments of CCC activities, while important, seem less important than the educational experience for conservation. The work of the CCC crews was valuable to Bennett in proving the validity of his ideas about the benefits of concentrated conservation treatment of an entire watershed. The large-scale approach also permitted experimentation. Few of the conservationists' techniques were new, but the process of fitting them together was. The work led to the refinement and improvement of conservation measures still used today.

This experience, among both SCS staff and the enrollees, provided a trained, technical core of workers for SCS for years to come. Former enrollees joined the staff and during the early years, CCC funds provided for nearly half of the agency's workforce. In addition to contributing to the passage of the Soil Conservation Act of 1935, the CCC also was instrumental in helping the soil conservation district movement off to a healthy start. When the states began enacting soil conservation district laws in 1937, it came as no surprise to the SCS field force that the first districts were organized near CCC camp work areas.

CCC's real contribution, however, lay in proving the feasibility of conservation. The positive public attitude associated with CCC work, including soil conservation, helped to create an atmosphere in which soil conservation was regarded, at least in part, as a public responsibility.

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Coon Valley, Wisconsin: A Conservation Success Story

Prepared for a talk at the 50th Anniversary of the Coon Valley Demonstration Project, Coon Valley, Wisconsin, August 13, 1983.

by Douglas Helms
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The town of Coon Valley hosted a celebration yesterday to mark the 50th year of one of America's conservation success stories. Coon Valley is located in the Coon Creek watershed in southwestern Wisconsin. The picturesque valley with fields of stripcropping winding around the hillsides, offers a startling transformation from the 1930s' scene of rectangular fields with straight rows that induced soil erosion.

In 1933 a new federal agency, the Soil Erosion Service, selected Coon Creek as the first watershed in which to demonstrate the values of soil conservation measures. This agency became the Soil Conservation Service (SCS) in 1935. Under the National Industrial Recovery Act of 1933, soil erosion control was included as one means of public employment. The announcement caught the attention of a soil scientist in the U.S. Department of Agriculture, Hugh H. Bennett. For years Bennett had been making speeches and writing articles to alert Americans to the need to do something about soil erosion. After discussions between public works administrator Harold L. Ickes and Secretary of Agriculture Henry A. Wallace, Bennett became head of the Soil Erosion Service in September 1933.

Bennett had $5,000,000 to demonstrate how farmers could plan farming operations to include soil conservation for long-term productivity. He decided to select a number of erosion-prone areas for demonstrations. Through cooperation with farmers, he would demonstrate the validity of his ideas about soil conservation. In addition to the long-range value of sustained productivity, Bennett was convinced soil conserving measures would increase the farmers' incomes

To head the watershed-based demonstration projects, Bennett would appoint acquaintances who were also working on soil erosion problems. At La Crosse, Wisconsin, Raymond H. Davis was conducting research on soil conservation as superintendent of the Upper Mississippi Valley Erosion Experiment Station. Thus, Bennett wanted one of the demonstration projects in the Driftless area of narrow, fairly steep valleys where research results from the La Crosse experiment station could be tried. As the Coon Creek watershed was representative of a much larger area, the methods that proved successful could be spread throughout the unglaciated section of the Midwest.

Davis responded enthusiastically. He soon seized on the 91,000-acre Coon Creek watershed as the best location for a successful demonstration. Important in his decision was the cooperation he anticipated from farmers. They seemed to be ready for a change. A few farmers were already attempting stripcropping. The strips of hay, alternated with strips of corn, slowed the runoff of water and reduced erosion from the corn strips. But most of the area was beset by erosion problems. Gullies hindered farming. Coon Creek was subject to frequent, intense floods. Some valuable bottom land had reverted from cropland to pasture due to floods. Trout abandoned the sediment clogged stream.

That the Coon Creek farmers raised dairy and beef cattle and thus needed hay and pasture encouraged the prospect for contour stripcropping and retirement of the steeper fields to pasture. Davis wrote to Bennett, "If it were not for the diversified type of agriculture generally practiced and the relatively large areas of timber, the entire area would be a barren waste within a short time. Since most of the farmers here try to

diversify their farming operations, any comprehensive erosion control program should be relatively easy of accomplishment because it would mean only a change in certain farming methods rather than a complete change in the agricultural set-up."

Initiatives by Coon Valley farmers and businessmen and officials at the University of Wisconsin led to Coon Creek's selection. Noble Clark, assistant director of the experiment station, and biologist Aldo Leopold welcomed Davis' proposal. Davis and Clark traveled to Washington, D.C., to meet with Hugh H. Bennett on October 3, 1933. On October 10, Bennett appointed Davis a regional director with authority to select a demonstration area in the Driftless area.

Enthusiastic response by Coon Valley area farmers decided the issue as to where the project would be located. In mid-October, Regional Director Davis met with 125 farmers at Coon Valley who listened to his proposal for soil conservation work. They promised to present a petition by 500 to 600 of the valley's 800 farmers requesting that the project be located at Coon Valley. Davis was pleased beyond expectation. He wrote to Bennett, "In fact, I was surprised at the way the farmers grasped the importance of such a program. They all realize the necessity of something (sic) being done....I feel that we need not worry about lack of cooperation in this particular area."

With the decision made, I. N. Knutson, Coon Valley banker, urged farmers to cooperate. Mail carrier Ben Einer notified farmers. Davis began preparing for the spring work. Aerial photographs were to be made for the farm planning. Seed, fertilizer, and equipment had to be acquired. Davis also needed specialists to visit each cooperating farmer to determine the needed work to reduce erosion. To do this work, Davis hired Herbert A. Flueck, Marvin F. Schweers, Joseph P. Schaenser, and John R. Bollinger. Others hired during the initial days were Gerald E. Ryerson as agricultural engineer and Melville H. Cohee. Aldo Leopold believed that the program could be used to increase wildlife in the area. At his suggestion, Ernest G. Holt became the biologist for the staff.

Through the winter of 1933-34, the erosion specialists contacted farmers to arrange 5-year cooperative agreements. The agreements often obligated the government to supply fertilizer, lime, and seed. Farmers agreed to follow recommendations for stripcropping, crop rotations, rearrangement of fields, and retirement of steep land to pasture or woodland. Alfalfa was a major element in the stripcropping program. Farmers were interested in alfalfa, but the cost of seed, fertilizer, and lime to establish plantings had been a problem during the Depression.

Another key element in reducing erosion was building up the water absorbing capacity of the soil by lengthening the crop rotations and keeping hay strips in place longer. A typical three year rotation on the farms had been corn--small grain--hay (timothy and red clover). Conservationists advised farmers to follow a four- to six-year rotation of corn--small grain--hay (alfalfa mixed with clover or timothy for two to four years.)

Civilian Conservation Corps enrollees and emergency employment workers were available. The town of Coon Valley rented land for a CCC camp. The young men and other workers were quite useful in a number of phases of the conservation work. They crushed the locally available limestone to provide the lime needed to establish the hay and pasture planting. Terracing required considerable labor, as did the fencing and reforestation work.

Grazing of woodland had been a contributing factor to erosion from cropland. Trampling down the ground and stripping ground cover reduced the forest's capacity to hold rainfall. Moreover, the grazing delayed tree growth while providing little feed for cows. Most of the cooperative agreements provided that the farmer would not graze the woodlands if the CCC workers fenced them off and planted seedlings where reforestation was needed.

The workers also tried to control gullies, especially where they hindered farming operations. Streambank erosion presented another problem. While the soil conservation measures would reduce sediment flowing into Coon Creek, there was still the problem of bank cutting and deposition in the stream. Wing dams, willow matting, and planting willows were the most used methods of control.

Workers also established feeding stations to carry birds through the winter. Gullies and out of the way places, not conveniently farmed, were used for wildlife plantings. Some farmers agreed to plant hedges for wildlife which also served as permanent guides to contour stripcropping. In so far as possible the trees selected for reforested areas were also ones that provided good wildlife habitat.

What then were the results? Clearly the farmers of Coon Valley came to believe stripcropping with longer crop rotations was the system of farming best suited to the area. From fall 1933 to June 1935, 418 of the valley's 800 farmers signed cooperative agreements. Others would have joined, but the Soil Conservation Service shifted new funds to other projects. Aerial photographs reveal that long after the demonstration project closed, additional farmers began stripcropping. From Coon Valley this practice spread during the 1940s, 1950s, and 1960s into adjacent valleys of the Driftless area. It is now the commonly accepted way to farm hillsides. Gradually the demonstration projects were phased out. But beginning in the late 1930s SCS provided technicians to locally authorized conservation districts to assist farmers with conservation measures.

Since Coon Valley is one of the nation's most studied watersheds, we know the effects of the conservation practices on erosion and sedimentation of streams. In a 1982 study, Stanley W. Trimble, geographer at the University of California at Los Angeles, and Steven W. Lund, U. S. Army Corps of Engineers, used earlier sedimentation studies by Vincent McKelvey and Stanford Happ in assessing the current situation. They calculated that erosion has been reduced at least 75 percent since 1934. Sediment reduction came without converting much cropland to other uses. There has been a 6 percent reduction in cropland since 1934. With less sediment flowing into Coon Valley, the trout returned as Raymond Davis had hoped and expected.

The young conservationists gained valuable experience at Coon Creek and the other 174 demonstration projects. On the cooperating farms, they tried numerous ideas. A few failed, but many are in use today. SCS people who started at Coon Valley moved on to other responsible positions. Marvin Schweers became SCS's state conservationist in Wisconsin and Herbert Flueck held the sane position in Minnesota. Gerald Ryerson and Melville Cohee eventually moved to SCS's national headquarters. Leopold's friend Ernest Holt became head of SCS's wildlife work and earned an international reputation. Numerous others took the Coon Creek experience and moved to other demonstration projects.

Coon Creek and the other projects were designed to demonstrate the value of soil conservation to farmers. In doing so, they also attracted a larger audience and contributed to the passage of the Soil Conservation Act of 1935, which made SCS a permanent agency in the U.S. Department of Agriculture.

But one need not look to legislation and landmarks for the significance of the Coon Creek project. Its heritage is available for all to see who venture that way.

Impact on Wildlife Guided SCS From Start

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by Douglas Helms,
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As Hugh Hammond Bennett went about assembling a team to start soil conservation demonstrations in late 1933, Aldo Leopold's classic *Game Management* had just been published. Its central thesis, and the central thesis of the new discipline of game management, held that "game can be restored by the creative use of the same tools which have heretofore destroyed it--axe, plow, cow, fire, and gun."

The concept fit perfectly the notion of rearranging farming operations to conserve soil. Methods for wildlife conservation could be used on the farm in conjunction with soil conservation methods.

Leopold and others had come to realize that publicly owned wildlife areas could help preserve some large predators and provide habitat for some migratory birds, but the impact of these publicly owned areas was limited. The use of the vast areas in farmland would eventually determine the nature of the nation's wildlife population. The realization that public agencies alone could not provide for healthy wildlife population was in part the foundation of Leopold's concept of a land ethic--that it was the responsibility of all land users to conserve land resources, including wildlife.

Hugh Bennett, his small staff, and a group of professors at the University of Wisconsin planned a soil conservation demonstration project for Coon Valley, Wisconsin. Leopold, then a University of Wisconsin professor, suggested that biologist Ernest Holt be hired to add wildlife considerations to project plans. In Bennett, the founder of SCS, Leopold found a ready convert who supported the integration of wildlife conservation into soil conservation programs.

Bennett, who had hunted the woods in his youth and tramped the country as a soil scientist, had reached the conclusion that wildlife was less abundant than in his youth. Bennett also had written seminal articles on the influence of erosion on vegetational change. While he did not dwell on the effects on wildlife, the impact on quality and quantity of food for wildlife was clear.

Farming had at one time benefited some varieties of wildlife. The interspersion of forests, swamps, and fields of small grains and other food crops provided the three crucial elements of survival--cover, food, and water--and actually resulted in an increase of bobwhite, cottontail rabbits, and certain nongame birds. The "edges" or zones between different vegetational types gave wildlife a variety of habitats that increased their ability to thrive.

But larger fields and the use of heavy, modern equipment reduced this variety and caused a decrease in wildlife habitat. Merging wildlife considerations with soil conservation sought to re-create these edges or zones of habitat.

Fencing of woodlands to eliminate grazing reduced erosion, improved timber production, and provided more wildlife habitat. Stripcropping, especially with hay crops and small grains, benefited wildlife. Field borders slowed water runoff and provided more edges for wildlife habitat. Biologists recommended plants with high wildlife value for badly eroded areas.

In addition to Coon Valley, other demonstration projects in North Carolina, Pennsylvania, and South Dakota employed biologists. But the discipline had little presence in USDA until a Secretary of Agriculture's memorandum in November 1935 authorized a section of Wildlife Management in SCS. By 1938, the staff nationwide had grown to 79 people.

Holt recruited such people as William Van Dersal and Edward H. Graham, who became noted experts and authors in the field. Graham's *Natural Principles of Land Use* examined the ways in which knowledge of living things could help guide land management.

Actual field work provided SCS biologists an opportunity not only to increase wildlife on the farms, but to learn new methods of wildlife enhancement. The field biologists worked with farmers and SCS field staff to incorporate wildlife considerations into farm plans. They disseminated the lessons of their practical field experience through numerous guidelines, technical bulletins, and popular articles.

With the expansion of programs and national legislation to enhance fish and wildlife, the role of biologists and the requirements made of them have changed. Rather than serving as planners who spend a great deal of time developing the wildlife section of conservation plans, they now more likely work as trainers who instruct others in how to integrate biology with the various SCS programs.

Concerns about the impacts of small watershed projects on fish and wildlife habitat increased the biologist's role in evaluating design changes to lessen adverse impacts on wildlife. The passage of the Endangered Species Act and the National Environmental Policy Act have further broadened the scope of the biologist's role.

SCS biologists are now required to have a thorough knowledge of SCS and other USDA programs to address fish and wildlife concerns. Biologists advise on policy matters and evaluate the effectiveness of measures for fish and wildlife in the Great Plains Conservation Program, Water Bank, Conservation Reserve Program, "Swampbuster," and other programs to make the job of planning easier.

Farmers and ranchers are becoming more interested in wildlife-associated recreational income. This, plus the public's growing interest in fish and wildlife, will likely result in additional programs and authorities that need the expertise provided by biologists.

Ranging Back to History

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by Douglas Helms,
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Today, approximately half of all ranchers cooperate with the Soil Conservation Service in developing their range management systems. From its inception, SCS has been concerned with rangeland as well as cropland.

When SCS began operations in the 1930s, it was well recognized that the effects of erosion on rangeland presented as much of a problem as the erosion on cropland. The U.S. Department of Agriculture's Forest Service had begun imposing grazing fees to try to reduce overgrazing on the rangeland under its control. Researchers in USDA, many of them in the Forest Service, had begun to examine the relationship of grass cover to flash floods and to explore the best methods of trying to establish grasses on rangelands. Erosion from rangeland was recognized as a threat to large Government-financed reservoirs for flood control and irrigation water.

By the 1930s, USDA plant explorers were being sent to discover "drought resistant" plants for the semiarid West. Concerns over the condition of rangeland led to a USDA survey in the 1930s, "The Western Range:'

The USDA bulletin "Soil Erosion: A National Menace" furthered Hugh Hammond Bennett's crusade to awaken agriculturalists to the dangers of soil erosion. His coauthor, William Ridgely Chapline, who was in charge of grazing research for the Forest Service, wrote the section on the western grazing lands.

The assignment of the young SCS range specialists was to work with ranchers to develop grazing systems that would conserve and improve the condition of rangeland. Ranchers could certainly observe changes in their range and in the mixture of plants and their vigor after heavy grazing. But the exact relationship of range to the number of cattle and the timing and the intensity of use of the range remained complex. The highly variable nature of rainfall complicated the matter. Impacts of poor or wise usage of the range on beef production would not immediately be obvious. The task of the young conservationist was to persuade ranchers that range management benefited not only the land, but also, given time and patience, the rancher.

The range specialists in SCS needed a system to promote range management that was understandable to the SCS field technicians and ranchers alike. Ranchers needed a system that would give them some indication as to when and how much the range might be grazed without causing deterioration and would allow rangeland in poor condition to improve.

Early 20th-century range specialists came to realize that intense grazing caused a change in the composition of range plants. Some plants increased, others decreased in the mixture; new plants, or invaders, appeared.

About the same time, ecologists such as Frederic Clements at the University of Nebraska were studying prairie plant communities. Clements theorized that grasslands were a community in various stages of plant succession progressing toward a climax. By applying this concept to rangeland, SCS developed range condition classes--poor, fair, good, or excellent. E. J. Dysterhusis, an SCS range scientist, applied the principles of quantitative ecology

(inventorying the plant community) to the system. The variance of the existing plant community from the potential climax community determined the range condition for that site. Relic sites provided an approximation of the climax community.

Armed with this information, the range specialist could then determine the range condition for the ranchers and advise them on grazing practices that would help maintain or improve range conditions.

The range site and condition system has served SCS and the range well for several reasons. First, this system is easily understood. Second, by trying to approximate or maintain natural range conditions, it produces a plant community that is valued for many uses, such as wildlife habitat, water retention and infiltration, and erosion control.

Various specialized grazing systems have been proposed and used. However, the range site and condition classification has remained the foundation of SCS's range management assistance. Indeed, surveys between the 1930s and the present have indicated a general improvement in rangeland.

International Conservation: It's as Old as the Hills

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by Douglas Helms,
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All conservation is international in the sense that few of the methods tried, at least those that are successful, remain isolated in one region forever.

The early European migrants to North America who would make a "Nation of immigrants" brought their culture, including their agriculture. The oft-told story is that America's problems with soil erosion derived from a type of agriculture developed in a land of moderate rainfall and slopes. Its transferral to a land of intense rainfall and steep slopes caused soil erosion.

But that is only part of the story. Europe also sent methods of conservation. Scottish farmers had long been regarded by their contemporaries as backward. But in the 18th century, Scotland revolutionized the way its hilly lands were farmed to such an extent that its farming became regarded as the best in Europe. Sir John Sinclair converted the Scots to horizontal ridges (on the contour). For very steep lands, Sinclair recommended the turn-wrest plow, a progenitor of the hillside plow.

Some of the German groups settling in North America became model farmers who concentrated on maintaining fertility on small, intensively used farms rather than following the pattern of land exhaustion, abandonment, and westward migration.

The immigrants learned from the Native Americans, who had adapted agriculture to climate and geography. Native American methods varied from the slash and burn of the East to intricate irrigation and water-spreading systems in the West. Americans during the 18th and 19th centuries made many adaptations and ingenious inventions of their own.

When the Soil Conservation Service started field operations in the 1930s, it also started investigating the nature and control of erosion. Much of this involved research at experiment stations.

But Hugh Hammond Bennett, then Chief of SCS, and Walter Lowdermilk, the Assistant Chief, were firm believers in learning from foreign countries. Their interest extended not only to particular practices, but also to a broader understanding of the impacts of erosion on the welfare of nations.

Both traveled widely. On his trip to Europe, the Mediterranean area, and the Middle East, Lowdermilk examined the influence of erosion on civilization. SCS has distributed more than 1 million copies of his bulletin about the trip, "Conquest of the Land Through 7,000 Years."

SCS erosion history staff studied historical soil conservation practices, in both the Old World and the New, for solutions that could be used in work of the new and burgeoning Soil Conservation Service.

Other countries established soil conservation agencies in the late 1930s and 1940s. Several founders of those agencies visited and studied the U.S. system. Indeed, a trip was almost obligatory. SCS made its published manuals on soil conservation available in Spanish.

SCS started a system whereby young students of soil conservation would come to the United States to work in field offices and learn the latest conservation methods. This method had another important aspect: When returning to work in his or her native land, the conservationist should be attuned to any cultural or geographical conditions that might call for modifications of the methods used in the United States.

In the decades since World War II, SCS has become more involved in foreign assistance missions. Current thinking on the best means of technology transfer seems happily matched with some of SCS's preferences and operating methods. Throughout its history, SCS has emphasized the technically trained person assisting the land user.

Experience has shown one of the preferred methods of technology transfer to be when the foreign country plays a role in the decision-making. Institution-building, such as helping establish a soil and water conservation unit operated by that country's citizens, bears great promise, not only for the present, but also for the future--which, after all, is what conservation is about.

The Development of the Land Capability Classification

by Douglas Helms,
National Historian, Soil Conservation Service

In understanding the land capability classification (LCC), the author benefited greatly from conversations with Richard W. Arnold, Kenneth C. Hinkley, Tommie J. Holder, Donald E. McCormack, and Ralph J. McCracken.

The 1985 Farm Bill which Congress is currently considering includes provisions that have far-reaching consequences for conservation. Part of the concern over erosion during the last decade or so has focused attention on USDA farm programs and specifically on the possibility that the programs encourage the use of very erodible land for clean-tilled crops. One tactic advocated in restructuring programs has been to discourage the bringing of highly erodible land into production. In the 1985 farm bill this provision has been called "Sodbuster." The other thrust has been to encourage the removal of highly erodible land from cultivation to be put to other productive uses. The "Conservation Reserve" would remove highly erodible land from cropland uses.[1]

But how do we identify these highly erodible lands for purposes of writing legislation and operating USDA programs? The Sodbuster provision uses the land capability classification to identify highly erodible land, specifically classes IIIe, IVe, VI, VII, and VIII; while the Conservation Reserve clause gives the Secretary of Agriculture discretion to use LCC and/or the erodibility index--a system based on quantifiable factors in the universal soil loss equation.

The discussions have raised questions as to the value of land capability classification, particularly for identifying erodible farmland. The merits and limitations of the LCC have not been without debate, but previous discussants have been mainly soil scientists and soil conservationists. Their discussions seldom reached the pages of the professional journals. Now farm organizations and conservation groups have differing opinions as to the value of land capability classification for the purposes stated in the bills.

How did the LCC come to be regarded as a suitable indicator of erosion hazards? First, we need to investigate the origin of the system, see how the Soil Conservation Service implemented and used it, and see how it has been put to uses other than the ones stated. For over forty years the Soil Conservation Service has used land capability classification as a planning tool in laying out conservation measures and practices on farms so as to farm the land without serious deterioration from erosion or other causes. The land capability classification is one of innumerable methods of land classification that can be based on broad interpretations of soil qualities and other factors of place.[2]

The current LCC includes eight classes of land designated by Roman numerals I thru VIII. The first four classes are arable land--suitable for cropland--in which the limitations on their use and necessity of conservation measures and careful management increase from I thru IV. The criteria for placing a given area in a particular class involve the landscape location, slope of the field, depth, texture, and reaction of the soil. The remaining four classes, V thru VIII, are not to be used for cropland, but may have uses for pasture, range, woodland, grazing, wildlife, recreation, and esthetic purposes. Within the broad classes are subclasses which signify special limitations such as (e) erosion, (w) excess wetness, (s) problems in the rooting zone, and (c) climatic limitations. Within the subclasses are the capability units which give some prediction of expected agricultural yields and indicate treatment needs. The capability units are groupings of soils that have common responses to pasture and crop

plants under similar systems of farming.[3] In choosing to designate classes not suited to continuous cultivation, the drafters of the legislation seized on classes VI thru VIII and subclasses IIIe and IVe. The question for the policy and law makers is whether the land capability classes, especially IIIe and IVe, are accurate and the best method of identifying erodible land.

The most common problem pointed out is that the land capability subclasses do not necessarily indicate the degree of erosion on a progressive and consistent basis. For example it is possible that a subclass IIIe soil is more erodible than a IVe soil. There are reasons inherent in the grouping of soils in the LCC to explain this situation. But it nonetheless causes some confusion when looking upon the LCC as an indicator of erosion.[4] Since the system was designed to deal with numerous factors of suitability of land for agricultural uses, a review of the development of LCC should add some degree of understanding to the debate over measuring erodible soils for program purposes.

Hugh Hammond Bennett, the creator and first chief of the Soil Erosion Service, influenced nearly all aspects of the Soil Conservation Service. While he did not originate the LCC, he embraced it. More importantly for our discussion the LCC was born out of the attempt to farm land without loss of quality or quantity. The early soil conservationists often spoke of developing a permanent agriculture in the United States--a system of cultivation under which land would be used without deterioration. This attitude was the philosophical heritage of the land capability classification.

As a soil surveyor for the Bureau of Soils, Bennett became concerned about the problem of soil erosion. Promotion to inspector of the Southern Division of the soil survey work afforded him an opportunity to view problems on a wider basis. Foreign assignments also influenced his thinking. Long before the development of the land capability classification, it is possible to detect some of the thinking that would go into it from Bennett's voluminous correspondence and numerous articles. One of his first forays into suggesting corrective action for soil erosion was a more traditional type of land classification--the sepration of forest lands from farmland based on soil type or series. Based on his years of work in the South he wrote an article on classification of forest lands in the proceedings of the Third Southern Forestry Congress published in 1921. He admitted that there was little experimental research on tree productivity or cost-of-production information to justify classifying certain soils as forest soils. But he definitely believed that there were other criteria which disqualified some soil types as farmland. He wrote, "Through the Coastal Plain and Piedmont regions...there are here and there areas of eroded rolling lands and even of stony lands which are obviously not adapted to farming on account of topographic unfavorableness or stoniness...."[5] Since slope is one of the factors influencing soil formation, it followed that certain soil series were nearly always found on slopes. The Susquehanna clays were one such soil.[6] Lauderdale was another soil that usually occurred on rough topography. He classed other lands as forest land because of stoniness or poor drainage, but he was also concerned with the influence of slope on erosion. In the Piedmont section of Georgia he believed that over a million acres were best suited to timber, because of "rolling or gullied surface and stoniness, and probably an equal area, if not more, should be devoted to timber or grass or both because of its slope and resultant susceptibility to washing, representing land which under the ordinary systems of cultivation eventually will be completely and irreparably destroyed."[7] To Bennett's thinking the student of soils had a particular reason for wanting to contribute to the reforestation effort. It was he who had seen the most "land wastage through unnecessary erosion...and wasted effort on poor farm land."[8]

Also, Bennett was becoming aware that erosion was not related strictly to the degree of slope. Evidences of different degrees of erodibility certainly existed in the United States, but foreign travel

provided striking examples. While working on the soil survey of Cuba, Bennett found a "peculiar tropical" soil in which the clay particles clustered together in floccules and allowed rapid infiltration of water. The soil seemed "to be not in the least susceptible to erosion."[9]

By 1928 Bennett had formed some ideas about the causes of erosion. These were "(1) soil character, (2) character of vegetative cover, (3) degree of artificial ground modification, (4) degree of slope, and (5) climate."[10] He preferred not to rank the causal factors in importance, except that he thought "soil character probably should head the list."[11] To illustrate the influence of soil properties on erodibility he contrasted an Abilene clay loam in Texas where 27 inches of rain removed 40 tons of soil from an acre of bare land on a two per cent slope with a Cecil sandy clay loam in Piedmont North Carolina where 36 inches of rain removed 25 tons per acre from bare ground on a nine per cent slope.[12] Nationwide, this was not the best comparison to make as the Cecil sandy clay loam was also a highly erodible soil. But Texas and North Carolina were two of the few places where the agricultural experiment stations had gathered data on erosion. While the Piedmont soils were very erodible, there existed soils in the U. S. on steep slopes with little erosion, namely clay lands in the Pacific Northwest which were used mainly for fruit production.[13]

Gradually field observations led Bennett to some ideas about farming systems and slope of the land which were revealed in his writing. He corresponded with J. Russell Smith, a geographer, who wrote *Tree Crops.* Smith wanted to devote lands too steep for cultivation to tree crops--not just timber but all manner of food, forage, fibre, oil, and other crops. In the Southern Piedmont, Bennett wrote to Smith, slopes over 15 per cent should not be plowed except to establish grass or legumes, and that it was "unwise to use any of these Piedmont slopes for continuous production of the clean-tilled crops except in nearly level areas."[14] The solution to man-induced erosion would be at hand Bennett wrote to another of geographer, when agriculturalists learned the best methods of farming "under the varying conditions of climate, soils, slope, vegetative cover and agricultural usage."[15]

Slowly, the U. S. Department of Agriculture and a few state experiment stations were beginning to accumulate some of the information Bennett believed was needed to design farming methods under these varying conditions. One of his first successes in the crusade for soil conservation was the creation of a group of soil erosion and moisture conservation experiment stations. Congressman James Buchannan added an amendment to the 1930 Agricultural Appropriations Act to provide for the stations. By the summer of 1930 there were six stations established and another four were added. Bennett hoped to have some 25 to 30 stations eventually.[16] At the least he hoped to have stations in the 18 erosion problem areas that he had identified.[17] The stations began evaluating the influences of various combinations of crop rotations, tillage practices, and mechanical and engineering conservation practices on erosion. Bennett, under the title, "In Charge, Soil Erosion and Moisture Conservation Investigations," supervised the research of the Bureau of Chemistry and Soils, while the Forest Service and Bureau of Public Roads handled other stations. Prior to the establishment of these stations the information about influences of farming systems on erosion had indeed been scant. Texas had established a station at Spur devoted to soil erosion research,[18] while Missouri and North Carolina had some soil erosion work among their experiment station research programs.[19]

The stations were to provide some of the quantitative data from field plots that was needed to devise soil conservation farming methods. But there remained much to be learned from the point of view of examining where erosion had occurred and the reasons. In many ways the product of this thinking, the erosion survey--which was to influence the land capability classification--was another Bennett-inspired idea. As head of the soil erosion investigations he supervised detailed soil erosion

surveys in some localities in Kansas, Virginia, West Virginia and Texas. He summarized the results in *Geographical Review* in 1928.[20] In selecting sites for the soil erosion and moisture conservation experiment stations Bennett ordered similar erosion surveys. These surveys differed from later erosion surveys in that there were few categories of information gathered. They consisted mainly of the depth of soil and subsoil losses along with measurements of erosional debris on footslopes and valley lands.[21]

But the erosion survey that was to influence the operation of the Soil Conservation Service came later. In 1933 the Georgia Experiment Station of the University of Georgia and several bureaus in the U. S. Department of Agriculture collaborated on a study of Georgia's land use problems, with a view towards improving the economic and social life of the rural population.[22] Glenn L. Fuller, who had been in charge of soil surveys in Georgia, which were conducted cooperatively with USDA, headed the survey of erosion conditions in the lower Piedmont--popularly called the Old Plantation Belt--where fifty per cent of the farms had been abandoned between 1920 and 1930.[23] Never one to quell his enthusiasm on the importance of his calling, Bennett wrote to a colleague they were working on "some real erosion surveys, the first ever made in the history of the world so far as I know of."[24] The surveying method involved classification of land based on sail, slope, degree and kind of erosion. What made it unique--the first in world--to Bennett was that they tried "to classify and map erosion conditions in their relation to other physical characteristics of the land and to the agricultural capacity and needs of the land."[25]

The authors did not use the term "land capability," but there are clearly precedents to the land capability classification. The items in the survey were similar to those later used by SCS in farm planning and in determining the place of land use in the land classes of LCC. Moreover, the Georgia study, including the erosion section, was to be a planning document. The erosion survey should not only map erosion, but also suggest the possible and desirable uses of the land. In the section pertaining to the survey the authors averred that it was an "effort to account for the present conditions of the land in terms of slope and use as a basis for determining the best major use for lands of various soil types in the Lower Piedmont counties."[26] In this regard, it was the philosophical predecessor to the LCC.

The detailed survey covered five areas of 8,000 to 10,000 acres plus a strip one-eighth mile wide and 210 miles across the lower Piedmont from the Savannah River to Alabama.[27] During the survey, the investigators found it necessary to modify their categories. Eventually they settled on 4 slope groups: A (0 to 3%), B (3 to 7%), C (7 to 12%), and D (over 12%). There were twelve erosion classes with the description including information on the amount of A horizon lost due to sheet erosion, the amount of B horizon lost due to sheet erosion, and whether the gullying was shallow or deep. Other categories covered frequently overflowed land, and land too gullied to permit cultivation. An underscored numeral in the system indicated reestablishment of cover that had stopped gullying. Other survey indicators covered soil series and land use.[28] The survey allowed for some correlations by soil type. Due to soil formation processes soil was often correlated to slope groupings; and therefore some land use recommendations could be made based on soil type. In their recommendations the authors placed all the upland soils in five groups, a thru e, with general recommendations of land use and where terracing and "soil improvement" were needed.[29]

Later in the same year, 1933, Bennett had the opportunity he wanted--a chance to demonstrate the value of soil conservation; the notion that farmers could safely raise crops without excessive soil erosion. In the demonstration areas where the newly formed Soil Erosion Service would work with farmers there was a need to first gather information about the land, its current condition and uses, so as to plan the on-farm conservation measures. Bennett,

the chief of the new service, selected areas near the experimental stations so that the information learned there could be of use, but there remained a need for a survey of individual farms as means of planning. The soil surveys being made by the Division of Soil Surveys in the U. S. Department of Agriculture were of little help in farm planning, according to Bennett, other than in identifying soil types. It was not on the scale needed, and had little or no information on slope, kind, and degree of erosion, and current land use.[30]

The newly formed Soil Erosion Service would conduct its own surveys for purposes of farm planning. They decided to use aerial base maps on a scale of one inch to 500 feet because of the detail desired in farm planning.[31] A Section of Conservation Surveys, headed at first by Bennett's collaborator from Georgia, Glenn Fuller, established procedures and issued instructions. The survey centered on four factors: (1) character and degree of erosion, (2) present land use or cover, (3) percent and class of slope, and (4) soil.[32] The information was expressed in the following order:

Erosion - Land Use

Slope - Soil

Thus, the hypothetical composite symbol,

$$\frac{\bar{3}\ 7\ R\ F'\ --\ L}{6B\ -\ 12}$$

taken from *Procedure For Making Soil Conservation Survey* meant:

$\bar{3}$ - 25 to 75 percent of the topsoil lost by sheet erosion with erosion stabilized

7 - occasional gullies, uncrossable by tillage implements

R - 25 to 75 percent of the A horizon lost by wind action

F' - wind accumulations 0 to 6 inches deep, covering less than one-third of the area delineated from which the topsoil previously has been removed and the accumulations are now partially stabilized

L - cultivated

6B - slope suitable for cultivated crops, with a dominant slope of 6 percent for area delineated

12 - Cecil sandy loam[33]

With this information in hand for individual farms it was then time to plan conservation measures. The task was to translate the complex symbols, denoting the physical conditions of the land, into recommendations of corrective land use. Concurrently, the farm planners had to explain the need for changes with the farmers. The result of these needs were first called "classes of land according to use capabilities."

The procedures for developing the capability classes were published in the *Soil Conservation Survey Handbook* of August 1939 under the name of E. A. Norton, who then headed the Physical Surveys Division.[34] But J. Gordon Steele, a staff member, recalled that the system was developed somewhat earlier and that the handbook represented the culmination of a team effort.

> It came about between 1936 and 1936. We were all thinking, all the time, all of our soils men all over the country, about how to interpret these surveys for practical use. This grouping into land capability came about quite naturally I think as a joint effort. I suppose Roy Hockensmith and I had probably as much to do with it as anyone. But who furnished us our ideas I do not know.... We were looking for a practical and a

> simplified, some people said over simplified, interpretation of technical details.[35]

The original system, and the explanations of its development and proposed use, are interesting in light of later revisions and uses of the land capability classification.

There were to be four classes of arable land, Roman numerals I thru IV. The classes indicated the most intensive tillage that could be used while permanently maintaining the soils.[36] The farmer could cultivate Class I without special practices, while Class II could be used with simple practices. Class III required complex or intensive practices, and Class IV was not recommended for continuous cultivation. Class V, because of topography, stoniness, erosion, poor drainage, or some other feature could not be used for even occasional cultivation. Classes VI through IX were reserved for grazing regions. The first three of these classes, VI through VIII, applied to grazing land that should be managed with an increasing degree of care; while Class IX was land unsuited to grazing.[37] In setting up the classes according to use capability, soil conservation surveyors should consider four factors: "(1) permanence of the soil if cultivated (susceptibility to erosion); (2) productivity of the soil as conditioned by native fertility, capacity for retention and movement of water, salt content, aeration, or other factors; (3) the presence of any factor that would interfere with cultivation, such as stoniness or a hardpan layer; and (4) the climatic environment, particularly temperature and precipitation."[38] Thus, the thinking that went into the first version of the system included some of the limiting factors that would later be formalized into subclasses.

The originators of the system also realized that classes of land were not permanent. Any number of changes in the land such as accelerated erosion, accumulation of salts, artificial drainage, or supplies of irrigation water would call for reclassification of the area. Likewise the introduction of new crops and farming methods would call for a reappraisal.[39] As Norton explained later at a land classification conference, his soil surveyors did not necessarily see the system as permanent. They hoped "merely to establish a national basis of classification which would be good for a generation or two."[40]

In the field, technicians were to develop the tables with information to show where land should be placed in the capability classification based solely on physical characteristics. Then the SCS technicians, other state and federal agricultural agencies, and the local people were to develop tables showing the alternatives--cropping systems, practices, measures, and soil treatment--recommended for each class of land.[41] The Physical Surveys Division directed the field offices to complete the tables by the time the soil conservation survey was completed.[42]

In developing the tables, SCS technicians were to rely on their observations as well as the experience of farmers so as to combine "local experience with technical knowledge."[43] According to Norton the "experience of the local farmers and ranchers is interpreted in scientific terms and both science and local experience are combined to develop a classification designed to assist in obtaining good land management."[44] Norton and colleagues who produced the first instructions realized the implications of such a procedure and that "the classes developed for different areas may not be precisely comparable."[45] Without stating so, they undoubtedly saw this as a minor problem. The objective was conservation farming, not uniformity among regions.

The first instructions also left some room for development of what were to become the subclasses. To assist in farm planning, technicians were allowed to develop symbols for groups of practices to correct erosion problems or unfavorable physical conditions such as poor drainage or stoniness. But any further subdivisions, for specific practices, were discouraged in the interest of maintaining the simplicity of the system.[46] About a year after the *Soil Conservation Survey Handbook* had been issued,

Norton elaborated on the issue of further dividing the system. Subdividion of the major classes, based on "soil types, topography, or some other physical factor," would be advisable provided the recommendations for correction by crop rotations, practices, and measures could be made uniform. But he did not want further subunits on the maps. After all, the purpose was to simplify the information from the soil conservation surveys. When productive indexes were available, they could be included, but in tables, not on the maps.[47]

Norton and colleagues anticipated some of the coming criticism that the system was not attuned enough to the economics of farming. He admitted that there were "physical, economic, and social factors," involved in changes needed to maintain land in a permanently productive condition while, at the same time, using it for agriculture. But it was best to start with a classification based solely on physical conditions, against which the economic and social factors could be "correlated to make a complete land classification."[48] What this meant in practice was that the SCS technician and farmer worked out these matters in the farm conservation plan.

Major changes were not long in coming to the land capability system. In September 1940, SCS divided Class V into four classes, V thru VIII. Apparently over the objections of some eastern SCS officials, the western contingent won.[49] The range management specialists preferred their range surveys to the capability classes.[50] The revision reserved the first four classes for cultivatable land, and established three non-cultivatable classes, V - VII, which could produce permanent vegetation for grazing and woodland under increasing limitations. The final class, VIII, did not produce vegetation for agriculture.[51] The earlier version had divided the land capability into classes for arable regions and classes for grazing regions. The revision attempted to establish a national system.

As with any new system there were some problems in implementation. When Norton's assistant, Roy Hockensmith, visited Kansas and Nebraska in 1941 he found that there was "a tendency for the field men to map capability classes direct, rather than map the soil, slope, and erosion as it actually existed in the field." Such a procedure, or shortcut, has often been a temptation, here and abroad.[52] J. Gordon Steele told the author that someone was always coming up with the idea of expediting capability classification, by dispensing with detailed soil surveys on which to base the capability classification.[53] On the national level the staff tried to achieve uniformity of the capability classifications between regions--ensuring that the same soil type was placed in the same class in each region. The regional office had the same chore in regard to classification on the state and area level. According to Hockensmith, both control groups had problems achieving uniformity.[54]

Two events influenced the conservation surveying work--the rapid formation of conservation districts and World War II. After local areas began forming districts in 1936, the operations of the program expanded rapidly, while World War II removed experienced personnel. To meet the increased demand under these conditions, SCS changed its surveying techniques in 1943. They developed a new type map which would be immediately available. This map denoted "land units that have uniform management requirements." The Service claimed that little detailed information of value was lost and that they could speed up their surveying with this method. This survey, like the more detailed soil conservation survey, was used to classify land capabilities. The over 31,800,000 acres surveyed in fiscal year 1943 made for a total of more than 156,000,000 acres covered by detailed surveys. The surveys section and their workers, by October 1943, had completed the land capability tables and recommendations on more than 800 conservation districts.[55] Most of the districts in 1943 which had completed classification recommendations were in the southern states, where the early district movement was strongest.[56] The surveyors preferred to make surveys of whole sections of soil conservation districts, counties, or watersheds. Throughout the

course of the war increasingly they had to give up this concept and map individual farms for conservation planning.[57]

Although some surveyors in the military returned to SCS after the war, the survey work was further strapped by the increased needs of conservation planning. During most years, the surveyors were mapping more than 30,000,000 acres. One result of the work load was to allow experienced and trained farm planers to make their own maps for use in conservation planning. At least two regions adopted this policy.[58]

After World War II, the Soil Conservation Survey Division turned its attention to improvements in the land capability classification. It seemed that different states and regions continued to classify similar soils differently. Studies were under way to harmonize the discrepancies across state and district boundaries. In areas other than the humid cropland sections of the east, surveyors were having some problems in classifying land. Committees were appointed in the late 1940s to study particularly nettlesome problems, namely how to map and classify wetlands, land needing irrigation, and dry-land farming areas.[59]

Also, there were changes in the system after the war. By 1947 subclasses had been authorized to show particular limitations and problems within a class. The attitude had always been to keep the subclasses from proliferating so as not to make the system more complicated. Roy Hockensmith, who succeeded Norton as head of the Physical Surveys Division, wrote that the subclasses should be "used only when absolutely necessary."[60] According to Albert A. Klingebiel, who worked on one of the committees on LCC in the late 1940s, Bennett finally settled the matter by decreeing that there would be no more than four subclasses. Some of the soil conservation survey staff believed that the uses of LCC would have been served better by including a few additional limitations for subclasses.[61]

By 1949 the land capability units had been added. The capability unit was the lowest grouping in the three-tiered system. The capability unit could provide a great deal of interpretive information to the farmer. The unit consisted of soils that were nearly uniform in "possibilities and management needs."[62] Where detailed information was available from research and practical experience on the best cropping systems and conservation measures, the material would be available in field offices in technical guides for the farmer. Obviously the recommendations and interpretations tied to the capability units needed constant updating as new technology became available.[63]

In addition to the primary purpose of farm planning, SCS was making other uses of land capability classification. Two other uses included area land use planning and inventorying conservation needs. Beginning in 1938 SCS issued a series of "Erosion and Related Land Use Conditions," which were renamed "Physical Land Conditions" in 1941. The surveys were made by the soil conservation survey methods mentioned earlier, and usually covered a demonstration project, a watershed, a soil conservation district, or a county. Beginning with the publication of the erosion survey of the Crooked Creek Project near Indiana, Pennsylvania in 1940 by J. G. Steele and R. G. Mowry, the Service began using LCC to tabulate the acreages of particular soil groups, cropland, idle land, pasture, and woodland in each capability class. The grouping suggested the land use adjustment needed and the conservation treatment needed, but the maps were not produced in sufficient detail to enable on-farm planning.[64] In creating soil conservation surveys and the capability groupings SCS made the distinction between the published survey made on a scale for areawide planning and the more detailed unpublished surveys for on-farm conservation which were kept in local SCS offices.

In 1945 SCS issued *Soil and Water Conservation Needs Estimates for the United States* which included estimated current acreages of land use--cropland, grazing land, and woodland-- under four groupings: (1) classes I, II, and III, (2) class IV, (3)

classes V, VI and VII, and (4) class VIII. SCS had started collecting the data and making the estimates in 1942.[65] Almost coincidentally with introducing LCC as a farm planning tool, SCS had added other objectives, inventorying resources and areawide planning.

By the late 1940s the Service was referring to its soil conservation surveying activities as the "National Land-Capability Inventory." In appealing to Congress, Bennett said the inventory should be completed as soon as possible. His rationale was that in a national emergency we would need full production--without harming the resources. The national inventory would supply the information needed in the effort.[66] Gradually in the late 1940s the land capability classification was proposed for uses other than planning on-farm conservation, most often for tax assessment. Roy Hockensmith, then head of the Soil Conservation Surveys Division, advised that LCC maps when "properly interpreted may serve as a valuable guide in rural land assessments." He advised keeping the physical, or fairly permanent factors, separate from the economic, temporary data when setting up the system of assessments.[67]

One reason SCS adopted the LCC for other uses was that it was the only source of soils interpretation the agency had.[68] It was this difference in attitude and approach that had been a source of contention between Bennett and his SCS and Charles Kellogg's Division of Soil Surveys in the USDA's Bureau of Plant Industry, Soils, and Agricultural Engineering. The Division and its predecessors had been carrying out soil surveys in cooperation with the land grant universities since the late 1890s. But the funding was low and only a small portion of the country had been surveyed when SCS started its soil conservation surveys on a much larger scale to service the action side of its program--farm planning. The attitude of the Division of Soil Surveys as explained by Charles Kellogg, its chief, was that the soil survey should be a comprehensive inventory of the soils' properties and characteristics. Then soil scientists made predictions of how one could expect soils to react under various uses--or "interpretations" as they were called. From this point of view the soil conservation survey was too attuned to one objective, or interpretation--land capability classification for farm planning. In Kellogg's view, by gearing the survey of soil properties to one purpose, the survey could fail to meet other needs or interpretations and another survey would be necessary.[69]

But the SCS surveys were more extensive than surveys completed under the Division of Soil Surveys, and were in fact the only surveys available for much of the country. When SCS's Division of Conservation Surveys was mapping 30 million acres in 1950, it had 700 surveyors compared to fewer than 100 surveyors in Kellogg's Division of Soil Surveys.[70]

The land grant college association had long called for the merger of the two surveys. Bennett's retirement made possible the merger of the two divisions into SCS with Kellogg as its head. Henceforth, there would be one soil survey. The merger also had profound implications for soil survey interpretations, including the land capability classification. It linked the main user agency, SCS, with the group making standard soil surveys. As such it sped up the interpretation of soil surveys for various uses.

Also, Kellogg ordered a revision of LCC. Albert A. Klingebiel in the 1950s worked on a revision of LCC which would give soil scientists a "specific basis, criteria, and assumptions to use to place soils into units, subclasses, and classes."[71] It was an effort to make the system national and to tighten the criteria in an attempt to ensure that any particular soil would be classed similarly wherever it occurred. It would leave less room for individual interpretations in classifying soils.

Classification had tended to be relative within a state and area covered by SCS regional offices. The best soils would be placed in Class I and the other soils would be judged and classified relative to Class I. For instance, SCS staff in Alaska had clas-

sified some soils--the best in that state--as Class I, but they were directed to move these soils to a higher category because of climatic limitations.[72] The studies and work that went into Agricultural Handbook 210, *Land-Capability Classification*, issued in 1961, reconciled some of these discrepancies of classification. Also, the published soil surveys, after the merger of the two soil surveys, began placing the soil series in the LCC. This provided another means of striving toward uniformity in classifying soil series into only one class or subclass.

The attempt to create a uniform system illustrated one of the important points in the evolution of LCC. Originally the system allowed a great deal of flexibility at the local level. Local experience and observations were relied on in placing soils in a class and especially in developing conservation treatments. Simultaneously, the use of LCC for inventorying the need for further conservation work and the quality of land available created a desire that the system be uniformly applied throughout the country. These rather disparate objectives were difficult to reconcile to everyone's satisfaction.

Another trend noticeable in the evolution of LCC has been the constant refinement. Originally LCC was heavily weighted to cropland in humid areas. Through the 1940s, individuals and committees worked on problems of classifying rangeland, woodland, irrigated land, and dry farming areas. Also, the originators of the system were aware of problems in farming other than erosion hazards--other limitations which might cause a crop failure. Conceptually, these were included, but there was a tendency to try to refine LCC to better define the system in terms of limitations. Thus, there was the formal addition of the subclasses. Here again there was tension between differing objectives. When one considered the educational value of LCC in getting farmers to look at their land in terms of conserving it based on inherent capability, there was a desire to keep the system simple. At the same time, in attempting to create a national system, soil scientists tried to devise a system that would provide guidance for the classification of all soils throughout the country.

In the field, land capability classification was well received and well suited to its intended purpose of serving as a guide to on-the-farm rearrangement of fields and crops as well as the adoption of conservation practices. The terminology of LCC was well understood by people in the soil conservation profession. Discussions of prime farmland and land subject to erosion were often couched in terms of the LCC. Therefore it was understandable that the subclasses within LCC were proposed for the 1985 farm bill to designate erodible land.

But the LCC is not the system preferred by some professional soil conservationists, especially soil scientists. Briefly stated, their position is that the LCC is not the best system for identifying highly erodible soils. The contention is that LCC neither identifies particular soil characteristics such as erodibility, nor provides a means of measuring those soil properties. In the LCC, it is the combination of soil characteristics, and more specifically the interaction among those properties, that results in the placement of a particular soil in a class or subclass. The classes identify these combinations of limitations for use, not specific limitations such as erodibility.

Their other argument is that they have a better method. Beginning with the establishment of the erosion or conservation experiment stations in the early 1930s, USDA began gathering quantifiable information on the factors involved in erosion. By 1956 there were 7,000 plot-years and 500 watershed-years of basic data available.[73] The information made possible the development of the Universal Soil Loss Equation which, in the words of one of its advocates, "brought systematic quantification to farm planning," for soil conservation.[74] The six factors--rainfall erosiveness (R), soil erodibility (K), slope length (L), slope steepness (S), cropping and management practices (C), and supporting conservation practices (P)--provide a prediction

of expected soil loss, and indicate a set of alternative conservation measures to reduce soil loss.[75] As in the case of LCC, the system was developed mainly for the purpose of planning conservation measures, but with the possibility of measuring the influence of the various factors. For use in the 1985 Farm Bill, a study team of SCS and Economic Research Service experts proposed an erodibility index composed of the RKLS factors and a T factor which indicates permissible soil loss while maintaining productivity.

Representatives of some farmers, especially the National Association of Conservation Districts (NACD), favor retaining the land capability classification for identifying highly erodible lands. Their reasoning is that LCC is well known to USDA agencies and to farmers. They fear that the mathematical formula in the erodibility index will be understood by few, even in some USDA agencies which will have to carry out provisions of the farm bill. In the words of Charlie Boothby, Executive Vice-President of NACD, "the Universal Soil Loss Equation is not universally understood."[76] Also the implementation of the sodbuster and conservation reserve, if they become law, will not please every landowner. In such cases, it is argued, having a system which the land owner understands will be preferable. Also, they are concerned about who will make the calculations under the erodibility index for all the farm and ranch land involved.

However the matter is resolved, the attempt to identify erodibility has illustrated once again the nature of government's use of science, in this case soil science, in carrying out its authorities. From the 1930s, USDA, and especially SCS, has needed a means of making judgements about the causes of soil erosion in order to operate programs designed to conserve soil. Government funds were put into the scientific effort to devise a system. The result has been the land capability classification and the universal soil loss equation. While precision in measurement was desirable, it was not always necessary for furthering the program. When these planning tools were proposed as a means of making precise measurements there were of course differences of opinion about their suitability.

Endnotes

[1] For a discussion of the various means of measuring erodibility see Donald E. McCormack and Ralph E. Heimlich "Erodible Soils: Definition and Classification," A and P Staff Report No. 85-2 (Washington, DC: Soil Conservation Service, March 1385).

[2] For a discussion of what is implied by the term "land classification" see Charles E. Kellogg, "Soil and Land Classification," *Journal of Farm Economics* 33 (November 1951): 499-513.

[3] A. A. Klingebiel and P. H. Montgomery, *Land Capability Classification*, Agriculture Handbook No. 210 (Washington, DC: Soil Conservation Service, U.S. Department of Agriculture, 1961), pp. 1-3.

[4] For a discussion on this and similar questions see Linda K. Lee and Jeffrey Goebel, "The Use of the Land Capability Classification System to Define Erosion Potential on Cropland," A and P Staff Report No. 85-1 (Washington, DC: Soil Conservation Service, November 1984).

[5] Hugh H. Bennett, "The Classification of Forest and Farm Lands in the Southern States," *Proceedings of the Third Southern Forestry Congress. July 20-22, 1921*, p. 74.

[6] Ibid., p. 75.

[7] Ibid., p. 82.

[8] Ibid., p. 93.

[9] Hugh H. Bennett, "Geographical Aspects of Cuban Soils," *Geographical Review* 18 (January 1928): 80.

[10] Hugh H. Bennett, "Geographical Relation of Soil Erosion to Land Productivity," *Geographical Review* 18 (October 1928): 587.

[11] Ibid., p. 587.

[12] Ibid., pp. 584 and 589.

[13] Ibid., p. 590.

[14] Bennett to J. Russell Smith, November 7, 1932, Bennett Correspondence, RG 114, Records of the Soil Conservation Service, National Archives. Hereinafter, the abbreviations RG for record group and NA for National Archives will be used.

[15] Bennett to Douglas C. Ridgely, July 2, 1930, RG 114, NA.

[16] Ibid.

[17] Hugh H. Bennett, "The National Program of Soil and Water Conservation," *Journal of American Society of Agronomy* 23 (May 1931): 370; and *Agricultural Department Appropriation Bill 1930*, 70th Congress, 2d sess., p. 312.

[18] *Appropriation Bill 1930*, p. 315.

[19] Bennett, "Geographical Relation of Soil Erosion," p. 584.

[20] Ibid., pp. 579-605.

[21] Hugh H. Bennett, "Adjustment of Agriculture to Its Environment," *Annals of the Association of American Geographers 33* (December 1943): 185: and Bennett, "Geographical Relation of Soil Erosion," pp. 579-605.

[22] W. A. Hartman and H. H. Wooten, *Georgia Land Use Problems*, Bulletin 191 (Experiment: Georgia Experiment Station, May 1935), foreword.

[23] Glenn L. Fuller, "Charting the Effects of Erosion in the Old Plantation Belt of the Southern Piedmont," *Transactions of the American Geophysical Union 1934*, Part II (Washington, DC: National Academy of Science, 1934), p. 495.

[24] Bennett to J. Russell Smith, May 31, 1933, RG 114, NA.

[25] Bennett, "Adjustment of Agriculture to Environment," p. 186.

[26] Hartman and Wooten, *Georgia Land Use Problems*, p. 91.

[27] Fuller, "Charting the Effects of Erosion," p. 495.

[28] Hartman and Wooten, *Georgia Land Use Problems*, pp. 94-96.

[29] Ibid., p. 122.

[30] Bennett, "Adjustment of Agriculture to Environment," p. 186.

[31] For an example of a published farm planning map taken from aerial surveys, see *Soil Erosion: A Critical Problem in American Agriculture* (Washington, DC: Government Printing Office, 1935), pp. 36-39.

[32] Glenn L. Fuller, *Procedure for Making Soil Conservation Surveys: Outline No. 4* (Washington, DC: Government Printing Office, 1936), p. 1.

[33] Ibid., pp. 19-20. A discussion of the survey may also be found in Glenn L. Fuller, "A System for Correlation of Land Forms and Covers with Soil Classification," *Soil Science Society Proceedings* 1 (1936): 463-468.

[34] E. A. Norton, "Classes of Land According to Use Capabilities," mimeographed, Soil Science Society of America, New Orleans, November 1938.

[35] Interview with J. Gordon Steele by Douglas Helms, August 22, 1985.

[36] Norton, *Soil Conservation Survey Handbook*, p. 14.

[37] Ibid., pp. 16-20.

[38] Ibid., p. 15; E. A. Norton "Classes of Land According to Use Capability," *Soil Science Society of America Proceedings* 4 (1939): 380.

[39] Norton, *Soil Conservation Survey Handbook*, p. 14.

[40] E. A. Norton, "Land Classification as an Aid in Soil Conservation Operations," *The Classification of Land.* Bulletin 421. (Columbia, Missouri: Agricultural Experiment Station, December 1940), p. 298.

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[42] Norton, *Soil Conservation Survey Handbook*, p. 15.

[43] Norton, "Land Classification as an Aid," p. 296.

[44] Ibid., pp. 296-297.

[45] Norton, *Soil Conservation Handbook*, p. 14.

[46] Ibid., p. 18.

[47] Norton, "Land Classification as an Aid," p. 302.

[48] Ibid., p. 295.

[49] R. L. Von Treba to R. D. Hockensmith, June 30, 1947, Notebook #5, Hockensmith Papers.

[50] Interview with J. Gordon Steele by Douglas Helms, August 22, 1985.

[51] Field Memorandum SCS #848-B "Supplementing definitions of classes of land according to use capability", September 28, 1940, Hockensmith Papers.

[52] R. D. Hockensmith to E. A. Norton, October 30, 1941, Notebook #11, Hockensmith Papers.

[53] Interview with J. Gordon Steele.

[54] R. D. Hockensmith to E. A. Norton, February 9, 1942, Notebook #11, Hockensmith Papers.

[55] *Report of the Chief of the Soil Conservation Service, 1943*, p, 26.

[56] R. D. Hockensmith and J. G. Steele, *Classifying Land for Conservation Farming: Farmers' Bulletin No. 1853* (Washington, DC: U.S. Department of Agriculture, 1943), back cover.

[57] *Report of the Chief of the Soil Conservation Service, 1944*, p. 24, and *Report of the Chief of the Soil Conservation Service, 1945*, p. 29.

[58] Henry R. Adams to M. R. Hershberger, August 12, 1947, and Ralph O. Lewis to All State Soil Scientists, September 25, 1947, Notebook 20, Hockensmith Papers.

[59] "Soil Conservation Survey Division, Annual Report 1947," typescript, September 18, 1947, Notebook #20, Hockensmith papers; *Report of the Chief of the Soil Conservation Service, 1947*, pp. 27-28; *Report of the Chief of the Soil Conservation Service, 1948*, p. 30.

[60] R. D. Hockensmith, "The Scientific Basis for Conservation Farming," *Journal of Soil and Water Conservation* 2 (January 1947): 14.

[61] Interview with Albert A. Klingebiel by Douglas Helms, July 30, 1985.

[62] R. D. Hockensmith and J. G. Steele, "Recent Trends in the Use of the Land-Capability Classification," *Soil Science Society of America Proceedings 1949* 14 (1951): 384.

[63] Ibid., p. 387.

[64] J. G. Steele and R. G. Mowry, *Erosion and Related Land Use Conditions on the Crooked Creek Project near Indiana, Pa.*, Erosion Survey No. 16 (Washington, DC: Soil Conservation service, 1940), pp. 14-15.

[65] "Soil and Water Conservation Needs Estimates For the United States," (Washington DC: Soil Conservation Service, 1945), p. 1.

[66] David R. Gardner, "The National Cooperative Soil Survey of the United States," (Ph. D. diss., Harvard University 1958), p. 362. The Gardner thesis has been extremely valuable to the author because of information on LCC as well as leads provided in the bibliography.

[67] Roy D. Hockensmith "The Use of the Land-Capability Maps for Rural Real Estate Assessments," reprinted from Proceedings of the Forty-First Annual Conference on Taxation, sponsored by tke National Tax Association, 1948.

[68] Interview with Albert A. Klingebiel, July 30, 1985; and Gardner, "National Cooperative Soil Survey," p. 276.69.

[69] Kellogg, "Soil and Land Classification," pp. 493-513.

[70] Gardner, "National Cooperative Soil Survey," p. 274.

[71] Interview with Klingebiel.

[72] Ibid.

[73] L. Donald Meyer and William C. Moldenhauer, "Soil Erosion by Water: The Research Experience," in Douglas Helms and Susan L. Flader, eds., *The History of Soil and Water Conservation* (Washington, DC: Agricultural History Society, 1985), p. 96.

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[75] L. D. Meyer, "Evolution of the Universal Soil Loss Equation," *Journal of Soil and Water Conservation* 39 (March-April 1984): 102-103.

[76] Conversation with Charlie Boothby, Executive Vice-President, National Association of Conservation Districts, August 30, 1985.

Eroding the Color Line: The Soil Conservation Service and the Civil Rights Act of 1964

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As a young graduate in agriculture from North Carolina A&T University in the depression year of 1938, John Maynard Jones had difficulty finding a job in his discipline. Teaching agriculture in high school was one possibility. Working for the state extension service was another possibility, since most of the extension services in the South hired black county agents on a segregated basis to work with black farmers. Indeed Jones knew these jobs existed because the county agent had occasionally visited the family farm near Bahama, North Carolina. As with many of the white farm children who went off to the land-grant college and earned a degree in agriculture, their first choice was not necessarily returning to the family farm. Upon finishing college Jones' first job was as the principal of a three-teacher school. During World War II, he worked at a hospital at Fort Bragg in Fayetteville, North Carolina. The hospital paid better than high school teaching. An announcement posted on the bulletin board prompted him to take the civil service exam for jobs in agriculture in the U. S. Department of Agriculture.

The Soil Conservation Service offices in Washington, D. C. and the regional office at Spartanburg, South Carolina, offered interviews. Preferring to stay in North Carolina, Jones took the initiative and contacted the state office of SCS in Raleigh. After an interview with Earl Garrett, the state conservationist in North Carolina, Jones began his career at the SCS office in Wadesboro, Anson County, North Carolina.[1]

Jones thus became the first black professional "soil conservationist" in North Carolina. He was one of a very small corps of black employees of the Soil Conservation Service in the South who worked with black farmers. This paper describes the first Blacks working in the Soil Conservation Service and examines the efforts in response to the Civil Right Act of 1964 to expand equal opportunities for employment as well as equal access of minority farmers to government programs.

The organization that John Jones joined, like many another in the burgeoning Department of Agriculture, had its birth in the Depression. Hugh Hammond Bennett, who grew up near Wadesboro, North Carolina, where John Jones was first employed, had completed nearly three decades as a soil scientist in USDA when his crusade against soil erosion culminated in receiving some of the emergency employment funds, with which he planned to employ people to demonstrate the value of soil conservation. The passage of the Soil Conservation Act of April 27, 1935 gave some assurance that the agency would continue even after the Depression emergency had passed. Beginning in 1937, President Franklin D. Roosevelt and the Department of Agriculture began encouraging local groups to form conservation districts and elect local supervisors who could then sign cooperative agreements with USDA. Through the 50 years since that time, the main support given to the nearly 3,000 conservation districts has been placing trained soil conservationists throughout the countryside to work directly with farmers and other landowners. It was this corps that John Jones joined.

The Soil Conservation Service, like its other New Deal-born brethren, the Farm Security Administration and the Agricultural Adjustment Administration, dealt directly with farmers from the Washington office through regional offices. It encountered

some Washington conflict with the state extension services, a cooperative venture between the U.S. Department of Agriculture and the states, especially the land-grant universities. State extension services were fairly autonomous with few nationally directed mandates. Nonetheless, most of the extension services in the southern states made some attempt to hire trained black agriculturalists to work with black farmers.[2]

Before the Civil Rights Act of 1964, the Soil Conservation Service seems not to have had a consistent policy either in working with Blacks or in hiring graduates of the 1890 universities to work on a segregated basis with black farmers. The first black college graduates working with SCS seem themselves to have taken the initiative in applying for jobs. Undoubtedly there was resistance in sections of the South to hiring Blacks, and the existence of the few testifies to the lack of a policy for building a large black field force.

Texas seems to have progressed the farthest toward developing a separate and segregated service to work with black farmers in East Texas. Again the origins seem to have been based not so much on design, but partially upon chance. Richard Moody was the person selected to work with these farmers, but again the SCS did not seem to go out looking for an individual. The individual came to them. Moody was born near Giddings in Lee County, Texas, where his father owned a small farm. The Depression interrupted his education at Prairie View A&M, and he joined the Civilian Conservation Corps (CCC). Along with the Forest Service and the National Park Service, SCS supervised the technical aspects of the work projects that the young CCC enrollees undertook. During the life of the CCC, SCS supervised the work of more than 800 of the 4,500 camps. Black youths made up more than 100 of those CCC companies, many of which worked on private land.[3] Numerous CCC supervisors and enrollees came to work for the Soil Conservation Service, especially after the Soil Conservation Act of 1935 opened thousands of new jobs. However, there were few such opportunities for employment of the black enrollees. Richard Moody was the exception. The enrollees of Moody's company learned to lay out and build terraces, to seed and fertilize pastures, to run contour lines for stripcropping and contour rows, as well as other vegetative, mechanical, and engineering measures. It was here that Moody says he both acquired an interest in and knowledge about soil conservation: "Having experiences with various duties like that led me to believe that there still was a lot of help that was needed for farmers, and particularly black farmers. I found that black farmers are very easy to work with."[4]

Moody returned to Prairie View, received his degree, and then started teaching at Hempstead, Texas. While there he took the Civil Service entrance exam and recalls that he refused to indicate race on the form, believing he would have little chance for job interviews if he listed his race. Shortly afterwards he was contacted by the Soil Conservation Service about a job in Tyler, Texas. Dubious of the sincerity of the job offer, he requested a 60-day leave of absence from the school board so that he could return to his teaching job if the new employment was unpleasant.

Moody went to work in the Soil Conservation Service office in the Federal building in Tyler, Texas, in 1942. The CCC experience served him in good stead in building terraces and putting in other conservation measures. After accompanying SCS technicians for a while, he started conducting meetings and speaking to other SCS work units in an effort designed to test the acceptance and the possibility of opening up black units to work predominantly with black farmers. After working out of the SCS office in Tyler and proving his abilities and knowledge of conservation matters, Moody opened an office about a block away. While continuing to work with the black farmers in the area, he took in black trainees. The trainees learned the technical aspects of soil conservation while working with black farmers of Smith County. Some of the black farmers of the area already had been acquainted with the Soil Conser-

vation Service. One of the early demonstration projects, Duck Creek, in Smith County, had included some black-owned farms. In fact the first cooperators to sign an agreement with the Soil Erosion Service had been Bragg and Julia Ann Morris, black farmers of the area. Louis Merrill, who had directed the Duck Creek project, was now the regional director for the SCS region covering Texas, Louisiana, Arkansas, and Oklahoma.[5]

Moody and the trainees worked on the same things that had been emphasized in the project, such as terraces and stripcropping, and tried to convince more farmers to use cover crops, especially legumes, that would prevent erosion while adding fertility to the soil. In an effort to increase income and to shift some land from row crops, they emphasized improving pastures by utilizing fertilizer. Not infrequently, Moody and his trainees had to do their best to overcome superstitions that hindered adoption of new ideas. Some of Moody's trainees began moving to new locations where there were sufficient black farm owners for a new office. One trainee, Floyd Sanders, opened an office in Jefferson, Texas in 1944. Other trainees went to other locations in Texas. Unfortunately, several of the trainees, as well as Moody, became victims of a retrenchment after World War II when preference was given to returning servicemen.[6]

Evidently SCS did not contemplate hiring Blacks as soil conservationists in the early days. At the Log Cabin Center in Hancock County, Georgia, in 1946 Hugh Hammond Bennett told the assembled black farmers: "In those earlier days of the program, we hardly foresaw either, that in a few years we were going to have a corps of colored technicians--capable, trained soil conservationists to go out into the fields and work understandingly with the farmers in developing and applying complete farm conservation plans."[7]

At that time, according to Bennett, the SCS southeastern region had 50 black technicians, of whom 11 were in Georgia. In 1950 Thomas S. Buie, director of the SCS southeastern regional office at Spartanburg, South Carolina, said that in nine states in his region--excluding Texas, Arkansas, and Oklahoma--there were eight full-time technicians and five full-time aides working exclusively with black farmers. There were an additional 276 part-time aides and laborers on the SCS payroll.[8]

As Bennett saw more of the work of the employees, he seemed inclined to increase hiring to reach the South's black farmers. As he prepared for the annual meeting of the regional directors in 1950, he wrote to them: "I have been doing some thinking recently about the opportunities for trained Negro agricultural workers in the Soil Conservation Service. I have run into a few of them in my travels across the country--and they seem to be doing good work--and the thought occurs to me that we might use to advantage a number of additional technicians over and above those already employed."[9]

Bennett asked the regional directors to give some thought to the best means of increasing the work-force. He added that the student trainee program could be used, and that SCS could give some advice to the educators in the region as to the college courses required to qualify as a soil conservationist. These two methods of increasing enrollment were, of course, those used after the passage of the Civil Rights Act. Bennett also proposed granting leave without pay to black employees who might want to improve their education. Bennett further asked the regional directors to come up with some ideas for the summer meeting.[10]

Claude A. Barnett, director of the Associated Negro Press, prodded Bennett to increase employment of Blacks.[11] According to Barnett, the two had "talked about this problem for several years." Barnett employed the statistics on black farm ownership in the South in making his case, and promoted the Extension Service and Farm Bureau in North Carolina as examples of using trained black agriculturalists to work with farmers.[12]

Again Bennett planned to discuss the matter with the regional directors. "I agree with Barnett that we should try to have some negro technicians, and this is a matter that must be taken up with the Regional Directors during the summer meeting."[13] Barnett's arguments about the amount of land controlled by Blacks would have appealed to Bennett, who had elements of simplemindedness endemic to crusaders. The effect of land concentration on SCS program delivery was becoming obvious to the SCS people and raised the question of objectives. Was it the number of farmers assisted that was important, or was it the amount of land covered by conservation measures? The emphasis in the popular press and the newspapers in the last few decades on the loss of small farms has disguised to a certain extent the degree of concentration of farm land that existed in earlier decades. The concern was not strictly related to black farmers, but it certainly applied to them. In 1951, 43.5 percent of the farms SCS assisted were less than 100 acres, while only 7.6 percent were over 500 acres. Yet the conservation farm plans on the former group totalled 50 million acres, while the land in the latter group was 90 million acres. Bennett also planned to discuss this matter at the meeting.[14]

Bennett would soon be out as chief of SCS when he reached the mandatory retirement age. The reorganization of SCS in 1953 abolished the regional offices and placed administrative matters, including hiring, at the state office level. However, reviews of the starting dates of black employees in the SCS reveal that quite a number started in the early 1950s, so Bennett's interest in the very early 1950s probably had some limited effect.[15] In Louisiana, A. G. Fasen had been working out of an office at Grambling College. When Fasen decided to take another job, SCS located Leon Blankenship, who was teaching agriculture at a nearby high school. Blankenship grew up near Saline, Louisiana, where his parents owned a 600-acre farm. Both parents were public school teachers. All six of the children attended college; only Leon chose agriculture as a career. He attended Tuskegee University before being drafted into the Army. After the war he returned to Tuskegee for his degree in agriculture. He was in his second year of teaching vocational agriculture at Bernice, Louisiana, when the district supervisor of vocational agriculture approached him to replace Fasen as the work unit conservationist at Grambling College.

When Blankenship took the job in January 1951, he had two technicians and a clerk to assist him in working a six-parish area around Grambling. Unlike many of the white conservationists, Blankenship received no structured training at other SCS field offices before starting work. He received most of his training from the SCS technicians who travelled out from the area and regional offices to assist local field staff with aspects of engineering, agronomy, forestry and other matters. He recalled that engineer Robert Wilder was particularly helpful in training him in laying out terracing, ponds, and writing conservation plans for the farm. There was also a considerable amount of woodland improvement and pasture improvement to be done as fields in row crops were being converted to pasture and woodland. In addition to assisting farmers with the technical aspects of conservation, Blankenship helped them apply for cost-sharing money. Many farmers had difficulties acquiring money to apply practices. Often minorities would not seek financial assistance due to fear, lack of knowledge, or a history of poor service. Blankenship would take them to the local Agricultural Stabilization and Conservation Service office to apply for cost-sharing. When Blankenship went to work, many minorities in the areas had not heard of the Soil Conservation Service. He began holding night meetings to acquaint farmers with SCS. Blankenship's impression of the status of SCS's work with Blacks was that assistance was provided to the more aggressive, and progressive, black farmers who would ask for assistance. Since the white work unit conservationists had plenty of work, they were not making the effort needed to recruit, persuade, and encourage. Later in Blankenship's career, he was in the state office in Alexandria, Louisiana, and

was responsible for increasing minority participation in programs. He stressed that actively seeking out minorities had to be a part of the job requirement of the district conservationist if progress were to be made.[16]

In response to the Civil Rights Act and reports of the U. S. Commission on Civil Rights in the mid-1960s, SCS closed its segregated offices and Leon Blankenship had to close his office at Grambling College and move to the Soil Conservation Service office at Ruston. Unlike most Blacks working for the Soil Conservation Service, Blankenship had been a work unit conservationist under the general direction of the area conservationist. Now he was on the staff of a work unit conservationist, but he generally continued working with Blacks and continued to have his staff under his direction. In the new arrangement he worked with soil conservationist Don Spencer, whom he had known since childhood. Spencer had worked with Blankenship's father, who was a cooperator with the Soil Conservation Service. Evidently Spencer was one of the white work unit conservationists who attempted to involve all people in SCS programs. As Blankenship described it "He did what he could to make sure minorities got services."[17] Spencer had worked with vocational agriculture teachers in the black schools to get conservation into the curriculum. When Spencer decided to retire, he recommended that Blankenship succeed him as the district conservationist to head the office since he knew the area and the farmers. But he was not selected for the job. It was not until 1974 that Blankenship moved from working primarily with Blacks. He moved to Shreveport to work with the Trailblazer and Twin Valleys Resource Conservation and Development project. For the first time he had whites working for him primarily doing work vegetating school grounds, city parks, roadsides, and drainage ditches. From that job, he went on to the state office of the Soil Conservation Service in Alexandria. It was his job to increase participation of minorities in SCS programs.[18]

At Ruston Blankenship had worked in the hill area of Louisiana where most of the black farmers were congregated. Evidently the state authorities decided that farmers in the delta near Tallulah should receive similar assistance. The Resettlement Administration had purchased lands in the 1930s for projects to provide farms to black farmers near Mounds. Most of the land needed drainage to be productive cropland. But it seems this crucial need had not been taken care of in the 1930s. The need remained in the 1950s if farmers were to have a chance to succeed.[19]

One day Blankenship received a call from Don Richardson, the area conservationist, inquiring whether he knew someone who might work with farmers near Tallulah, Louisiana. He recommended Obie Masingale, whom he had met at Southern University. Masingale was born in Texas and grew up on a farm in Marion County about fifteen miles southwest of Jefferson, Texas. Like Blankenship, Masingale had known of the work of the Soil Conservation Service. His father had been a cooperator with SCS. Floyd Sanders had been a vocational agricultural teacher in the county before going to work with SCS in Jefferson.

Masingale trained under Blankenship until the fall of 1953 when he went to work near Tallulah as a work unit conservationist with an office in Thomastown High School. Masingale believed that drainage was crucial to success on the former Resettlement Administration projects. Few of the black farmers had good, well-drained soils. Because of the slight relief and high water tables, Masingale believed that the average farm would produce a crop only one out of three years. Thus, there was the need for drainage if the land were to be used for row crops. As in the case of Blankenship, Masingale had to go out and recruit farmers. Since drainage was the main work needed, money was more of a constraint here than in some other conservation work. Most farmers needed financial assistance. Some assistance was available in the form of cost-sharing from the Agricultural Stabilization and Conservation Service. A

few farmers knew about the aid. Masingale recalled,

> It was an educational process to most of the black farmers. In the first place, a lot of them didn't know what was available through the ASCS (Agricultural Stabilization and Conservation Service) office in cost-sharing. You had to explain that to them. Many of them were willing to carry out the projects and do the drainage, but they didn't have the money, or were too much in debt to get it.[20]

At least Masingale believed the reason for hiring black soil conservationists in Louisiana, few as they were, was to try to reach people who were being ignored, He believed that:

> ...the SCS people in the country would work with those people who could do the drainage, or get the terraces made, or plant the pastures--the elite black farmers who understood and they had money or could get it. So they worked with them. They wouldn't lose time with the fellow that you had to court and explain to him, really explain to him. Because he did not know about ASCS. Many of them didn't. We've had to take them in. They were scared to go in the office. We've had to take them in and apply. Let them see that you could apply and then get it.[21]

He continued his work in Louisiana until 1961 when he was asked to transfer to the SCS state office at Nashville, Tennessee. There he was to replace James Hughes, who had moved to the national SCS office in Washington, D. C.[22]

Hughes had been selected to work on a program to increase black employment in the agency in the early 1960s. He probably came to the attention of the national office of SCS because of his work on the Johnson Creek Watershed, where the cooperation of black farmers was needed in order for the project to succeed. This watershed, one of the many projects SCS worked on under the Watershed Protection and Flood Prevention Act of 1954, was one of the first to be studied for its effects on the incomes of the residents. Conservation education leader Martha Munzer had high-lighted the act in her book, *Pockets of Hope*. After his work on the watershed, Hughes moved to the SCS state office in Nashville, where he worked on programs to improve service to minorities in the state. There, the state conservationist in Tennessee, J. Ralph Sasser, was the most active of the state conservationists in the South in promoting more services to black farmers. Hughes moved to Washington to help in the effort to provide equal opportunity in hiring and programs.

President John F. Kennedy placed Vice-President Lyndon B. Johnson in charge of the President's Committee on Equal Employment Opportunity (PCEEO).[23] Johnson insisted that in contracting and employment, the federal government should not merely follow a negative nondiscriminatory policy. Rather, they should take affirmative action to ensure participation by minorities. The committee commenced collecting statistics on minority employment in the government. Former Secretary of Agriculture Orville Freeman recalled a telephone call late one night in early 1961:

> The telephone rang and it was then Vice President, Lyndon Johnson, and he said to me very sternly that looking over the records he was not at all satisfied with the minority representation in the Department of Agriculture and that it was about time that I got busy and did something about it.[24]

But USDA continued to have the reputation of being the slowest of the cabinet departments to hire blacks. Of the people in the department in a position to have an impact, the Administrative Assistant, Secretary Joseph M. Robertson, weighed in on the side of activism. Robertson believed the department would make little progress as long as routine procedures were followed. He advised the Secretary:

> The inertia in this area is unbelievable until you see it at first hand. We continue to live in a pattern of culture that has been developed over the last century, and to get us out of this is going to take, in my opinion, direct involvement by the Secretary of Agriculture and by his agency heads and that this program must be given a different order of priority from sugar, or rural areas, or any other commodity. If not, we will make about the same rate of progress that we have made in the past two years.[25]

In his role as in-house advocate, Robertson also sent Freeman Martin Luther King's famous and eloquent letter of April 16, 1963, written from the Birmingham, Alabama city jail. King was responding to clergymen who had referred to King's action in the civil rights movement as "unwise and untimely."

The Secretary was becoming more involved and authorized Joe Robertson to require monthly reports.[26] Administrator Donald A. Williams of the Soil Conservation Service reported to Freeman that he held a meeting of the state conservationists on June 18, 1963, and "all but two (of the state conservationists) had made special effort during the past year to employ Negroes in various vacancies." Several states were focusing on working with the 1890 schools on their curriculum. But the state conservationists of the southern states obviously did not want to be alone in efforts and "voiced the opinion that it was highly important that positive moves to employ Negroes not be limited to one agency alone."[27]

At the urging of the new president, Lyndon Johnson, Congress passed a major Civil Rights Act in 1964. In addition to placing greater emphasis on equal employment in hiring, the act also focused on the equality of participation in government services, by stating that: "No person in the United States shall, on the ground of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving federal financial assistance."[28] Among government departments, elimination of discrimination had required special emphasis in the Department of Agriculture. Through the years the transfer of scientific and technical information, the administration of price-support, acreage controls, voluntary soil conservation activities, and other programs, and even the use of regulatory type activities had relied on cooperation and acquiescence at the state and local level. State and local committees composed of appointed or selected volunteers often helped administer USDA programs.[29] Overall it was a system that made for effective delivery of programs to the countryside. But it was not designed to respond immediately to national laws and priorities, still less to deliver a rapid response to the spirit of the Civil Rights Act, which went against the grain of local mores, such as segregation.

The United States Commission on Civil Rights reviewed farm programs in 1964 and issued their report in 1965: *Equal Opportunity in Farm Programs: An Appraisal of Services Rendered by Agencies of the United States Department of Agriculture.* In the 16 southern states there were 6,100 Soil Conservation Service employees in July 1964. There were only 40 Blacks in that work force. Half of the 40 were in jobs classified as professional. The survey of SCS operations covered 67 counties where there were large numbers of black farmers. Sixty-six of the counties had one conservation farm plan for every four white farm owners. Twenty-six of the counties

reported one plan for every four black farm owners. The study also revealed that hiring black soil conservationists to seek out black farmers had increased participation in those counties. The study included one anomaly: Madison County, Mississippi, where the white soil conservationist had prepared conservation plans for 54 percent of the white-owned land and 77 percent of the black-owned land.[30] While accumulating the information, SCS found that of the Blacks who had conservation plans "a satisfactory number were applying conservation practices." The agency believed it an indication that greater efforts to reach Blacks would result in increased conservation farming in the South.[31] Despite the inequities, the commission found that SCS had been making efforts to recruit more black professionals and had been working toward eliminating segregated offices. The larger task remained, to provide equal opportunity in employment as well as ensuring that "the quantity and quality of service available to Negro landowners [was not] dependent upon the number of Negro staff in a given area."[32]

Soon after the passage of the Civil Rights Act, agencies were being required to make reports on progress. The Inspector General of USDA studied SCS operations in the South. SCS could quickly end the segregation in offices. They undertook a study to determine whether Blacks were being promoted as rapidly as whites. Such actions only involved internal decisions. Others actions involved the good will of the agency's clientele--the farmers. Black soil conservationists were no longer to be restricted to working with black farmers. Black landowners were not to be restricted to receiving help only from blacks. The service was to try to make sure that the black SCS employees participated in meetings of conservation districts as did their white counterparts. While there had been exceptions to all these cases before the Civil Rights Act, Administrator Donald A. Williams conceded the situation needed to be corrected. He was soon asking state conservationists in the South to report on progress. Williams also reminded the field that the attitude of the white staff in SCS field offices in the rural counties was crucial to accomplishing integration in work assignment and work with districts by smoothing the way.[33]

The other major thrust of the Civil Rights movement was, of course, to increase employment of Blacks in SCS. With Carl Lindstrom and Jim Hughes of the personnel section of SCS taking the lead, the agency had a short-term and long-term goal. Short-term goals involved quickly increasing the number of black employees through recruitment and working with the 1890 land-grant schools to suggest easily achieved curriculum changes that would quickly increase the number of qualified applicants for jobs in SCS. The longer-term goal in Lindstrom's strategy was to work with the 1890 universities on curriculum changes involving major realignment in course content, to the end that graduates would be well qualified for professional positions.[34] The curriculum work was crucial because most of the jobs with promotion potential in SCS required college credits in the agricultural and natural sciences. The heads of field offices, the soil conservationists, had college training in agriculture. Through tradition, many of the jobs in personnel, budget, finance, and other administrative support were filled by people with degrees in agriculture and who had worked at the field level as soil conservationists.

In addition to the people at the SCS state office, Carl Lindstrom and James Hughes travelled to the 1890 schools advising them on the changes needed in curriculum and recruiting students for the student-trainee program. Some of the small number of Blacks who already worked for the SCS in the South also recruited, while themselves serving as role models for those who wanted to pursue a career in agriculture. The program had a marked effect on the colleges of agriculture and SCS. Grant Seals, who went to Florida A&M University as Dean for Agriculture and Home Economics in 1969, recalled the impact:

> Upon my arrival, I found the summer SCS program

> already operative...The first few participants from FAMU had been agricultural education or agronomy majors. Upon the advice of SCS, FAMU had employed a soil scientist to teach soil survey and any other needed courses to constitute qualifying agronomy graduates. Students were recruited in high school and were hired out each summer thereafter as trainees learning about soils. They were also earning moneys for their tuition. As our recruiting program got stronger for the School (of Agriculture) as a whole as well as for soil science, the number of SCS enrollees increased. At its peak, we must have had nearly fifty students in all four years of training. We were graduating an average of 8-10, half of whom were then recruited by the Forest Service which hadn't invested anything in the program. But we still placed at least half to two thirds in SCS.[35]

The increase in hiring is also reflected in developments at Southern University. As early as 1965, the university added a course in soil science. Some agricultural majors had taken summer jobs with SCS. Hezekiah Jackson, Dean of the College of Agriculture at Southern University, wrote to SCS'S administrator Donald Williams on October 20, 1965, "You might also be interested in knowing that our recent relations with the Soil Conservation Service have contributed to increasing our agricultural enrollment 500% over the last year."[36] Working with 1890 universities to ensure that their graduates had the necessary courses to place them in position to pursue a career was laudable in many respects for it served both the interests of the students and the agency. But the changes in enrollment starkly revealed the sad state of affairs that preceded the Civil Rights Act. That a single agency in USDA could, by offering job opportunities, cause these dramatic increases in student enrollment demonstrated the impediment that lack of job opportunities had been to the development of the agricultural curricula at the 1890 schools.

From a very low base, the number of black employees grew. There were 83 Blacks on the rolls in 1962, 94 in 1963, 146 in 1964 and 368 in 1965. As of September 30, 1990, there were 12,821 permanent full-time employees of the Soil Conservation Service. Black employees numbered 926 of whom 627 were male. Of greater importance, 409 of the black males were in "professional" job series, where there is a greater chance for advancement in the organization. Another 132 Black males are in the "technical" jobs where there is a chance for advancement if some education goals are met. The numbers for females are 43 professional, 63 administrative, 54 technical, and 117 clerical. Thus the number of black females is significantly lower than the percentage of black females in the labor force. Like most other government agencies, the Soil Conservation Service has an equal employment program to try to address problems such as the overconcentration of black females in clerical jobs. The increase in black employment, from the days where there were only 40 black employees in the South out of over 6,000, has not eliminated all concerns about discrimination. There are sufficient formal complaints filed (under the procedures of the Civil Rights Acts) throughout the agency to attest to the fact that individuals believe they are being discriminated against because of race.

The degree to which Blacks have been able to move into the top jobs is also a concern. Whatever the makeup of the top administrative jobs should be, it is clear that some individuals have advanced in the administration. With the exception of the two top jobs in SCS--the Chief and the associate chief--blacks have served in most other job categories throughout the organization. A black employee has now served as a state conservationist in Arizona, California, Maine, Maryland, Massachusetts, New Jer-

sey, Nevada, and Wisconsin. A University of Arkansas-Pine Bluff graduate, Pearlie Reed, was the Deputy State Conservationist in Arkansas before moving on to the state conservationist's position, first in Maryland and currently in California. At the national office, Sherman Lewis and Platter Campbell have been division directors. Lewis is currently an assistant chief. Jacqueline Sutton was the deputy associate chief for administration.

In summary, the few Blacks who worked for the Soil Conservation Service in the 1940s and 1950s served their clientele well by focusing on those who were not being reached. To take one example, John Jones recalled that when he went to work in Anson County, North Carolina there were a few Blacks, those with fairly large farms, who were cooperators with SCS. But some of the black farmers in the northwest corner of the county around Burnsville and other communities did not have conservation plans. By the time Jones left the county, all the black farmers of the county were cooperators with SCS.[37] Jones and his contemporaries were role models for the generation of recruits who joined SCS after the Civil Rights Act of 1964. The response to the Civil Rights Act involved some innovative approaches in working with the 1890 schools to gain recruits. Some of the recruits of the mid-1960s have progressed through the administrative levels of the agencies. Yet, it remains obvious that continued vigilance is needed to ensure that those who do the public's business serve all the public and provide equal employment opportunities for those interested in soil and water conservation.

Endnotes

[1] Interview with John Maynard Jones, Bahama, North Carolina, September 29, 1990. During the course of the interview, the interviewer discovered that his great-uncle Luther Ross had worked with John Jones at Wadesboro laying out soil conservation practices.

[2] Allen W. Jones, "The South's First Black Farm Agents," *Agricultural History* 50 (October 1976): 636-44; and "Thomas W. Campbell: Black Agricultural Leader of the New South," *Agricultural History* 53 (January 19?9): 42-59; Wayne D. Rasmussen, *Taking The University to the People: Seventy-five Years of Cooperative Extension* (Ames: Iowa State University Press, 1989), 7, 52, 68, 72, and 103.

[3] Douglas Helms, "The Civilian Conservation Corps: Demonstrating the Value of Soil Conservation." *Journal of Soil and Water Conservation* 40 (March-April 1985): 187.

[4] Interview with Richard A. Moody, Tyler, Texas, May 17, 1990.

[5] Louis P. Merrill, *Soil and Water Conservation in the Western Gulf Region: Part II, The U. S. Soil Erosion Service, Project No. 20, Duck Creek, Smith County, Texas* (Temple, Texas: Soil Conservation, 1982), 72.

[6] Interview with Richard A. Moody, Tyler, Texas, May 17, 1990.

[7] Hugh Hammond Bennett, "Conservation Farming for Better Living," Address prepared for delivery by Dr. Hugh H. Bennett at the annual soil conservation jamboree at Log Cabin Center, Hancock County, Georgia, August 13, 1946, p. 5 (Hugh Hammond Bennett Papers, Department of Special Collections, Iowa State University Library, Ames, Iowa, hereafter HHB Papers.)

[8] The seeming decline in black technicians may be due to increased hiring during World War II and then the loss of jobs to returning servicemen. "Negro Soil Conservationists," Notes prepared for use by Dr. T.S. Buie in panel discussion on "The Changing Status of the Negro in Southern Agriculture," Rural Life Conference, Tuskegee Institute, Tuskegee, Alabama, June 18-20, 1950, T.S. Buie Speeches. Soil and Water Conservation Society, Ankeny, Iowa.

[9] Hugh Hammond Bennett to All Regional Directors, August 22, 1950, HHB Papers, Folder 22/3.

[10] Ibid.

[11] My former boss at the National Archives, Harold T. Pinkett tells me that he met Barnett's widow at an Association for Afro-American History meeting. She told him that Barnett was one of the "dollar-a-year" advisors to the three successive secretaries of agriculture, Henry A. Wallace, Claude Wickard, and Ezra Taft Benson.

[12] Claude A. Barnett to Hugh Hammond Bennett, May 5, 1951, HHB Papers, Folder 22/3.

[13] Hugh H. Bennett, Memorandum for discussion at Regional Director's Meeting, June 7, 1951, HHB Papers.

[14] Ibid.

[15] Study of Blacks in SCS in 1964, Records relating to civil rights, History Office, Soil Conservation Service, Washington, D.C.

[16] Interview with Leon Blankenship, Alexandria, Louisiana, May 15, 1990.

[17] Ibid.

[18] Ibid.

[19] Donald Holley, *Uncle Sam's Farmers: The New Deal Communities in the Lower Mississippi Valley* (Urbana: University of Illinois Press, 1975), 112-13.

[20] Interview with Obie Masingale, Baton Rouge, Louisiana, May 12, 1990.

[21] Ibid.

[22] Study of Blacks in SCS in 1964, Records relating to civil rights, History Office, Soil Conservation Service, Washington, D.C.

[23] Hugh Davis Graham, *The Civil Rights Era: Origin and Development of National Policy* (New York: Oxford University Press, 1990), 38-40.

[24] Orville Freeman, Oral History, February 14, 1969, p. 2, Lyndon B. Johnson Presidential Library, Austin, Texas.

[25] Joseph M. Robertson to Orville Freeman, June 6, 1963, Folder "Civil Rights," General Correspondence, Record Group 16, Records of the office of Secretary of Agriculture, National Archives and Records Administration, Washington, D.C. Hereinafter the abbreviations GC, RG, and NARA will be used.

[26] Orville Freeman to Don Williams, July 11, 1963, Folder "Civil Rights," GC, RG 16, NARA.

[27] Donald A. Williams to Orville L. Freeman, June 24, 1963, Folder "Civil Rights," GC, RG 16, NARA.

[28] Secretary's Memorandum No. 1560., Implementation of Civil Rights Act of 1964, July 10, 1964, Folder "Civil Rights," GC, RG 16, NARA.

[29] For a recent and important interpretation of USDA working relationships, see David E. Hamilton, "Building the Associative State: The Department of Agriculture and American State Building," *Agricultural History* 64 (Spring 1990): 207-18.

[30] *Equal Opportunity in Farm Programs: An Appraisal of Services Rendered by Agencies of the United States Department of Agriculture: A Report of the United States Commission on Civil Rights* (Washington, D.C.: GPO, 1965), 85-89.

[31] Ibid., 89.

[32] Ibid., 89.

[33] Donald A. Williams to State Conservationists, Advisory LEG-10, March 17, 1965, Civil Rights Records, History Office, Soil Conservation Service, Washington, D.C.

[34] Carl A. Lindstrom, Memorandum, Equal Employment in SCS, July 15, 1965, Civil Rights Records, History Office, Soil Conservation Service, Washington, D.C.

[35] Grant Seals to the author, September 12, 1990.

[36] Hezekiah Jackson, Dean of the College of Agriculture, to Donald A. Williams, October 20, 1965. Civil Rights Files, History Office, Soil Conservation Service.

[37] Interview with John Maynard Jones, September 29, 1990.

SCS and '1890' Graduates: Of Mutual Benefit

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by Douglas Helms,
National Historian, Soil Conservation Service

The number of black employees in the Soil Conservation Service has increased at varying rates over the years. A few were hired in the 1940s, primarily to work with black landowners. Greater numbers joined SCS following civil rights legislation in the 1960s.

Over the years, many of the blacks who have worked for SCS have been children of landowning black farmers. Blacks have owned farmland in the United States since before the Civil War, although the number increased fairly dramatically toward the end of the 19th century.

Though a distinct minority, some free blacks in the South acquired land before the Civil War. By 1830, some 647 rural free blacks in Virginia had acquired land. On the eve of the Civil War in 1860, there were 1,316 black farmers and rural landholders in Virginia who had property valued at $369,647. Maryland's rural black landowners numbered 519 in 1830 and 2,124 in 1860.

Despite the financial obstacles and the resistance to selling land to blacks, they continued to acquire land after the Civil War. Between 1870 and 1890, in the upper Southern States of Kentucky, Maryland, Missouri, and Virginia, the number of black landowners increased from 6,859 to 39,859. One out of three black farmers owned land. In the lower South, where resistance to selling land to blacks was greater, the progress was slower. Usually, less than one out of five black farmers owned land.

A passion for education accompanied the yearning to own land among many of the former slaves. Missionary societies established some of the first colleges for blacks after the Civil War. There were a few private colleges. But the schools called for in 1890 in the second Morrill Act constituted State-supported higher education for blacks in much of the South, because the first Morrill Act had benefited whites only.

Many of the blacks who have worked in the Soil Conservation Service are products of this environment. They are graduates of the 1890 Institutions and Tuskegee University, children of the landowning farmers.

During the 1940s, SCS hired a limited number of blacks to work in counties with large populations of black landowners. Bishop Holifield held such a position in Florida, as did John Jones in North Carolina, Howard Hardy in South Carolina, and Maurice Godley in Virginia.

In Texas, Richard Moody, a Prairie View A&M graduate, went to work for SCS in Tyler. In addition to working with black farmers in Smith County, Moody and his staff helped train additional blacks as soil conservationists to work in other parts of Texas. One of the trainees, Floyd Sanders, opened an SCS office at Jefferson, Texas, where his staff assisted black landowners in the Marion-Cass Soil Conservation District.

In 1951, SCS established the first of two offices in Louisiana to work with black farmers. Leon Blankenship and his staff at SCS's Grambling College office worked with hill country farmers on terracing, pasture improvement, woodland development, and farm ponds. Work unit conservationist Obie Masingale began work in the Delta parishes in January 1952 and helped farmers with landleveling, pasture renovation, and drainage.

The civil rights movement of the 1960s focused attention on securing the fundamental right to vote for all Americans and

ending segregation. The Federal Government began emphasizing equal opportunity in employment and equal access to Government services.

The establishment of the President's Committee on Equal Employment Opportunity in 1961 spurred Federal agencies to hire additional qualified blacks. SCS in Tennessee and North Carolina signed up a few trainees from "1890" universities in 1963. Also in 1963, James Hughes, from Tennessee, became special assistant on intergroup relations at SCS national headquarters.

In response to the Civil Rights Act of 1964, SCS closed segregated offices and moved swiftly to eliminate segregation in work assignments, which had been deemed discriminatory.

A 1965 policy stated that "SCS personnel who are members of minority groups are not to be restricted to working solely with minority group landowners and operators." Furthermore, "SCS minority group employees will meet with district governing bodies in their regular meetings."

The United States Commission on Civil Rights issued a report in 1965 on the programs of the U.S. Department of Agriculture. Of 6,100 SCS employees in 16 States in the South, the Commission found that 40 were black and only about half were in job categories considered professional.

SCS's strategy to hire more black professionals included signing up student trainees to work in the summer. The students could determine if this was the type of career they wanted, and could tailor college courses accordingly. The number of SCS student trainees increased in the years immediately following the Civil Rights Act, from 9 in 1965 to an estimated 60 in 1968.

SCS also hired "1890" university professors for the summer to familiarize them with the agency's work. SCS hoped the professors would incorporate their newly gained knowledge in the next year's courses and encourage students to undertake careers with SCS.

During the 1960s, SCS staff met with college presidents and officials and urged them to increase course offerings in soil science, one of the main requirements for qualifying as a soil conservationist.

With the prospect of employment by SCS and other agencies and the option of additional courses in agricultural fields, enrollment in agricultural degree programs increased. For example, the 1965 freshman class at Florida A&M included 40 students in the School of Agriculture--twice the enrollment in 1964.

How much or how little progress has been made toward fulfilling the promise of equal opportunity in both the Federal Government and society can be debated. The graduates from the 1890 Institutions and Tuskegee University who joined SCS in the 1960s have now spent more than 20 years with the agency. During that time, they have served at practically all levels in SCS.

More importantly, the racial makeup of the corps of soil conservationists in SCS is far different than it was on the eve of the civil rights movement.

Women in the Soil Conservation Service

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by Douglas Helms,
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"Tama Jim" Wilson, who served for the longest tenure of any Secretary of Agriculture (1897-1913), found the importuning for jobs in the department the most vexing part of the job. "Finding places for deserving women on the request of Senators who righteously plead their cause is the greatest difficulty I meet with," he wrote to a senator.[1] He found the situation of the unmarried women particularly distressing, as he confided to an old friend. "This is a great national eddy where human driftwood lodges. Young ladies are begging for the cheapest kind of labor here, who should go into families and do housework....So you see I have to look at the sad side of life here and sometimes I feel like taking my hat and going home to Iowa."[2] The few women in the early days found employment in the lower paid jobs. In March 1864, nearly two years after the creation of the U. S. Department of Agriculture, the Commissioner received authority to employ women as clerks. In 1891 there were 169 women in the U. S. Department of Agriculture, constituting about 12 percent of the employees. Throughout the government about 14 percent of the government typists were women.

The Bureau of Animal Industry hired women in field offices to do routine microscopic examinations of meat, which was required by an 1891 law.[3] A few women slowly found their way into professional positions. Among federal government departments USDA was the largest employer of women scientists, hiring about two-thirds of the government total in the 1920s and 1930s. *American Men of Science* listed 19 women scientists in USDA in the 1921 edition and 61 in the 1938 edition, two of whom were in the Soil Conservation Service. The Bureau of Plant Industry was a leader in government in hiring women scientists, especially plant pathologists. The Bureau of Chemistry hired a number of female chemists. Others found employment in the Bureau of Home Economics where the bureau chief, Louise Stanley, was the highest paid and highest ranking woman scientist in the federal government. But Stanley was the exception as other women scientists did not have the opportunity to advance in rank and remuneration.[4]

Women librarians worked in the Department's library, which in time became the most outstanding agricultural library in the world. During the early twentieth century several women held the post of Librarian of USDA. World War II was perhaps the high point in women's employment in USDA. In 1939, 20 percent of the employees were women. The figure was 34.09 per cent in 1943, before dropping back to 21 percent in 1947.[5]

Probably the first female employee of the Soil Erosion Service, predecessor to the Soil Conservation Service, was Lillian H. Wieland. On September 19, 1933, Hugh Hammond Bennett transferred from USDA to the Department of the Interior to head the Soil Erosion Service. The following day Lillian H. Wieland entered on duty as his secretary. Among the 12 employees in the Washington office in October 1933 were Wieland, Laura G. Fitzhugh, and Alberta Stanback.[6] Most of the early women employees of the Soil Erosion Service and the Soil Conservation Service, as it was renamed in 1935, were in secretarial and clerical positions where they were integral to the success of the operations. From its beginning as a few scattered demonstration projects, SCS developed into a national organization with upwards of 3,000 offices and more than 15,000 employees. The main work of the agency was working directly with farmers and ranchers on conservation problems. Such a far-flung organization

relied, in part, on competent professional secretarial and clerical work.

During the rapid initial growth of the organization, everyone felt the pressure to make a favorable impact so that the work would continue. Frances Hershberger recalled the early office work in Maryland. "[I] think all of us secretaries felt we helped to get the project for SCS in Maryland off to a good start. We worked diligently from 8 to 5, & for the first few months worked overtime. We not only worked 5 full days a week but also 1/2 day on Saturday."[7] Though the early secretarial staff may not have worked personally on conservation practices on the farm, they could enjoy the sense of group accomplishment. Estella B. Williams started working in Waynesboro, Pennsylvania, in 1935 and later transferred to Maryland. At the age of 91 (in 1989) in a retirement home in Hagerstown she wrote, "I still love to go through the country and see the strip cropping etc."[8]

Like their male counterparts, quite a number of the women who found employment in the early days made a career of the work. Secretaries throughout the organization have often been invaluable in providing continuity in cases where heads of office changed frequently. They know the organization and the key conservation partners in state agencies, conservation districts, and other areas.

Some states did not have clerks for districts; the area clerk would travel to the districts to do the work. Marjory A. McTavish, the area clerk at Butte, Montana, made work trips to each of 11 district offices four times a year. Now, when she speaks to groups and encourages young women to consider a career in the federal government, she uses a story to illustrate some of the attitudes that were all too prevalent about women's role in the federal government in the 1960s. "I was making a three-day trip, spending a day at Three Forks, then Townsend, and then Helena. I stopped in East Helena for gasoline. Now--this is in the early 1960s, and I am driving an olive green government sedan with decals on the door saying USDA-SCS and displaying government license plates. I drive into this station, roll down the window as an old fellow, the attendant, approaches the car, and I say, 'Fill it up, please.' He doesn't answer, just looks at me--then he proceeds to walk around the car. When he gets back to the open window, he says, 'Does the government let women drive their cars?'"[9]

In addition to the Soil and Water Conservation Society, SCS also has had a long association with the conservation districts and their national organization, the National Organization of Conservation Districts. Women have also played a large part in this cooperation--probably none more so in the formative period than Mrs. Ellen Cobb of Spartanburg, South Carolina. While a secretary with the Soil Conservation Service, she began helping with the meetings of South Carolina's state association of conservation districts. By 1941 she regularly attended and kept notes at the meetings and assisted with the growth of the organization.[10] E. C. McArthur, the first head of the state association, led an effort to organize a national meeting of district officials. Mrs. Cobb went to the meeting in Chicago in 1946 when the National Association of Soil Conservation District Officials was organized. Later Mrs. Cobb recalled the mood of the meeting that was so instrumental in the history of the conservation movement in the United States. It "was hot as Hades when those 17 men, plus McArthur, plus little me, sat around a table in the Morrison Hotel, and discussed the merits of a national organization, and I won't deny that some of them were doubtful; but after much talk, that great leader McArthur sold his idea."[11] The group authorized McArthur to hire Mrs. Cobb as the Executive Secretary. McArthur died in an automobile accident in 1947, and Kent Leavitt of Millbrook, New York, was elected as the president. Mrs. Cobb was clearly the most knowledgeable person about McArthur's plans for the infant organization. Mrs. Cobb moved to Millbrook and lived in a rented house which served both as her home and the office of the National Association of Soil Conservation Districts. With the organization on a better footing, Mrs. Cobb

resigned in June 1948 and returned to Spartanburg.[12]

Although most of the women in SCS during the 1930s and 1940s were in the secretarial and clerical fields, there were some women in the sciences and technical specialties. At the urging of the Science Advisory Board, the Soil Erosion Service set up a Climatic and Physiographic Division to do research in climate, ecology, geomorphology, and erosion history. Within the division Lois Olson headed the Erosion History Section, whose staff researched maps, documents, and records to determine the character of the natural landscape. This information could be used to establish datum points for studies in climatic change, the extent and rate of soil erosion, and changes in plant cover.[13] Olson had B.S. and M. S.. degrees in geography from the University of Chicago. She had studied at the London School of Economics and had worked with the American Geographical Society before taking the job with the Soil Erosion Service.[14] In addition to supervising the work of the section, Olson published articles from the research work in *Agricultural History*, *Geographical Review*, *Nature*, and *Soil Conservation.*

Due to the need for geographers to help with the war effort during World War II, Olson left SCS to work for the Office of Strategic Services; later she worked with the Department of State and the Central Intelligence Agency. During the period September 1942 through October 1943, SCS lost about 23 percent of its employees, many of whom went into military service or transferred to other government agencies. During that year 32 female employees joined the military services.[15] In the civilian labor force "Rosie the Riveter" had come to symbolize women's contributions to the war effort by working in jobs usually reserved for men. It seems SCS did not use this method a great deal, although there were some exceptions. Mary C. Baltz, a graduate of Cornell University, joined SCS as a "Junior Soil Surveyor" during the war labor shortage and continued with the agency as a soil surveyor until the early 1960s when she resigned.[16]

Another person in technical and informational work in the early history of the Soil Conservation Service was Charlotte Whiteford, later Charlotte Colton. Whiteford was elected to Phi Beta Kappa and then earned an M. S. degree in botany at Ohio State University before taking a job as a secretary with the soil science staff at the SCS office in Zanesville, Ohio in the mid 1930s. Her scientific training served her well in working with the staff. J. Gordon Steele, a soil scientist who had been in a plant ecology class with her at Ohio State, found his former classmate at the Zanesville office. In the late 1930s Steele was involved in publishing SCS reports entitled "Erosion and Related Land Use Condition," concerning the various SCS project areas. He recruited Whiteford to come to Washington as an assistant soil technologist to work on the reports. The job required both knowledge in soil science and editing. Whiteford took courses in editing and soil science in the USDA graduate school. At least one of the reports, *Physical Land Conditions on the Leatherwood Creek Demonstration Project, Lawrence County, Indiana*, included her as an author. Charlotte Colton continued to work as an editor, especially on soil surveys, and eventually became head of the publications staff of the Soil Conservation Service. She retired in the 1980s.[17]

A few women worked as public information specialists and editors during the early history of SCS; more joined in the 1960s through the 1980s. Phoebe Harrison regularly wrote and compiled the book review section of the early issues of *Soil Conservation.* Later she worked on the international aspects of soil and water conservation before retirement. Ruth Nordin headed the editing shop and from there helped women such as Georgie Keller, Catherine Blakely, and Juanita Grasty move up from lower grades to be publications editors. Nordin also taught editing in the USDA Graduate School and gave workshops on clear writing to SCS managers. Kay Mergen worked in the area of conservation education in the 1960s and 1970s.[18]

The work of SCS in farm planning, soil surveys, and other activities has relied in part on expertise in cartography, use of aerial photography, and remote sensing. Some women found employment in the cartographic center at the regional offices and later the technical centers, although often in the lower paid jobs of cartographic aid and cartographic technician. Probably the best known of the women who worked in the Soil Conservation Service in the late 1940s up into the 1960s was Verna C. Mohagen, director of the Personnel Division. A native of North Dakota, Mohagen went to work for the Veterans Bureau as a clerk-stenographer in 1927. In 1929 she moved to Washington, DC, to work for the Bureau of Chemistry and Soils. Like many another young person who came to the capital to work for the federal government, she soon found the local colleges and universities to be an opportunity to gain an education and to improve job prospects. By attending George Washington University at night over eight years while working full-time, she earned a B. A. degree (1934) and an M. A. degree (1937) in economics. She also took courses in public administration at American University. Miss Mohagen joined the Soil Conservation Service in 1935 and progressed until she was director of the Personnel Division in 1946.[19]

Mohagen advanced the career development concept in SCS. It was derived from the notion that leaders in the Soil Conservation Service, especially the state conservationists and the national headquarters leaders, should have work experience in more than one state and in a variety of programs. Previously, most of the people who advanced to state conservationists had long experience in one state. The concept that state conservationists should have experience in other states was regarded as revolutionary. Also, the Personnel section often identified young conservationists who should be given opportunities to get the experience needed to advance to national headquarters or to a state conservationist's position.

Mohagen had the support of the Administrator, Donald A. Williams, in this area. Thus, the young people in SCS throughout the field, especially those interested in progressing upward in the organization, knew of Miss Mohagen and the fact that they needed to be mobile and to acquire the experience needed to advance. Mohagen also pioneered in using the student trainee program and in using trainee programs to develop professionals in certain areas. SCS developed an administrative trainee program to develop administrative professional staff for SCS offices.

Black women were limited in opportunities not only by gender but also by race. Juanita Grasty was one of the few black women, if not the only one in fact, in the national office of SCS prior to the passage of the Civil Rights Act. Due to administration policy, SCS had begun efforts to hire more minorities in the 1960s. This effort was greatly strengthened by the Civil Rights Act of 1964.[20] Ermine F. Bates became the first black female hired in North Carolina when she joined the state office staff in Raleigh in 1964. She remained until her retirement in 1984. Martha Marbury joined SCS in 1967 and through her career became the first black personnel officer and the first black branch chief in the personnel division in the national headquarters. Maxine Barron joined SCS as the first GS-14 black female in SCS as a program analyst in 1980. Jackie Sutton moved from the USDA administration to become associate deputy for administration in 1983, and was the first female to occupy a Senior Executive Service job in SCS.

Legal changes in the 1960s and 1970s began to open more opportunities for women. Title VII of the Civil Rights Act of 1964 prohibited sex discrimination in employment in the federal government. Executive orders 11246 (1966) and 11478 (1969) required federal agencies to develop affirmative action plans.[21] The Equal Employment Act of 1972 (P. L. 92-261) required agencies to write EEO plans with "provision for the establishment of training and education programs designed to provide maximum opportunity for employees to advance so as to perform at their highest potential."[22] The Civil Service Reform Act of 1978 further stated that the policy of the

federal government was to provide a federal work force reflecting the nation's diversity.

In 1973, about a year after the passage of the Equal Employment Act, women occupied approximately 11 percent of the permanent full-time positions in the Soil Conservation Service. Eighty-nine percent of the women were in clerical fields, 5.3 percent in administrative and technical fields, and a scant 0.2 percent in professional fields. The average grade was 4.86.[23] At that time women comprised about 20 percent of USDA's work force and 40 percent of the work force of the federal government.

Agencies were required to develop Upward Mobility Programs to give greater opportunities for women to move into professional ranks. SCS's plan had been approved by October 1974.[24] Between 1970 and 1975, three years after the passage of the Equal Employment Act, the agency had made some progress in improving employment in the middle grades. Those in grades GS-7 and above increased from 24 to 44. The average grade for women moved from 4.72 to 5.24. There were 123 women in professional and student trainee positions.[25]

Currently about 24 percent of the permanent full-time and part-time employees of SCS are women. Thus the percentage has more than doubled. Of greater significance is the fact that women have opportunities in a wider variety of jobs. The Upward Mobility Program afforded some women the possibility of using a mixture of formal and on-the-job training to more into professional positions. In November 1975 there were 64 upward mobility positions filled and another 31 advertised. Greater emphasis on hiring allowed women to move into the technical specialties or to become soil conservationists. SCS had nearly 3,000 field offices working closely with soil and water conservation districts. Work in the field offices gave women an opportunity to work with the agency's primary clientele, the rural landowners. This experience was traditionally the route of advancement in SCS to management positions at the state offices and national level. Roberta Stevenson became the first woman district conservationist on October 12, 1975 at Welton, Arizona.[26] As of July 1991 there were 185 female district conservationists out of a total of 2,478 for the agency.[27] Four women have been have been state conservationists and the director of the Pacific Basin area is a female.

Various professionals in staff positions support the field operations of SCS. The changes brought on by the Equal Employment Act gave women who are interested in agriculture and natural resources opportunities to seek these positions. Among some of the professional categories, the number of female employees as of February 1992 were 85 soil scientists, 59 civil engineers, 30 range conservationists, 30 biologists, 21 agricultural engineers, 12 cartographers, 11 agronomists, eight geologists, 4 foresters, two hydrologists, one wildlife biologist, and one botanist.[28] Just to take one example of the changes, prior to 1984 there were no female professionals on the staff of the plant materials centers. There are now seven professionals on the staffs nationwide.[29]

At the national headquarters several women have been national specialists in their disciplines. Only one woman has been a division director, while three women have been associate deputy chiefs.

Listed below are the numbers and job categories for women in SCS. Only job series with over 50 people are included:

Number	Job Classification
595	soil conservationist
517	secretary
262	soil conservation technician
220	clerk
145	student trainee
139	computer specialist
137	clerk typist
85	soil scientist
77	personnel clerk
73	personnel management spec.
67	public affairs specialist
61	budget analyst
59	civil engineer

56	computer clerk
53	contract specialist

Women numbered 3,153 of the 12,825 permanent full-time and permanent part-time employees, or 24 percent, in 1992.[30] The continuation and expansion of equal opportunities for women constitute not only the just and legal path to take, but also the one most beneficial to the agency. For a natural resources agency such as SCS to continue with a well-trained, dedicated work force, it will need to make even greater efforts to recruit the best of those available of whatever gender, race, or ethnic group.

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[2] Quoted in Earley Vernon Wilcox, *Tama Jim* (Boston, Mass,: Stratford, 1930), p. 37.

[3] Vivian Wiser, "Women Scientists in USDA," Typescript. History Office, Economic Research Service, USDA, Washington, DC., 1987.

[4] Margaret W. Rossiter, *Women Scientists In America: Struggle and Strategies to 1940* (Baltimore, Maryland: Johns Hopkins University Press, 1982), pp. 223-235.

[5] Baker, "Women in the U. S. Department of Agriculture," 190-201.

[6] Robert L. Geiger, Jr. (Compiler) *A Chronological History of the Soil Conservation Service and Related Events* (Washington, DC: Soil Conservation Service, June 30, 1955), p. 1.

[7] Information supplied by Fran Hershberger, Rivera Beach, Florida, 1989. Responses to memorandum of John W. Peterson to State Conservationists, Subject: History of Women in SCS, January 26, 1989, File "Women in SCS," History Office, Soil Conservation Service, Washington, DC. The letter requested information from offices in SCS about women significant in the history of the organization. Hereinafter, footnotes in this article will cite the accumulated files of responses rather than individual ones.

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[9] File "Women in SCS," History Office, SCS.

[10] *Keepers of the Land* (South Carolina Association of Soil Conservation District Supervisors, 1972), pp. 39-43

[11] Quoted in R. Neil Sampson, *For Love Of The Land: A History of the National Association of Conservation Districts* (League City, Texas: National Association of Conservation Districts, 1984), p. 51.

[12] Sampson, *For Love of the Land*, pp. 49-71.

[13] *Report of the Chief of the Soil Conservation Service, 1935* (Washington, DC: Government Printing Office, 1935), p. 39.

[14] *American Men of Science*. 11th edition. (New York: R. R. Bowker Company, 1968), p. 1201.

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[16] Information compiled by Fred Gilbert of the SCS state office in Syracuse, New York, March 22, 1989. File "Women in SCS," History Office, SCS, Washington, DC.

[17] Gordon Steele to Douglas Helms, March 31, 1989, File "Women in SCS," History Office, Washington, DC; telephone conversation with Charlotte Colton, February 14, 1992.

[18] Telephone conversation with Lee Shields, February 5, 1992.

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[20] For a description of the impact on SCS see Douglas Helms, "Eroding the Color Line: The Soil Conservation Service and the Civil Rights Act of 1964," *Agricultural History* 65(2): 35-53.

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[22] Federal Personnel Manual System, FPM Letter No. 713-27, June 28, 1974, Ibid.

[23] S. B. Pranger to Robert W. Long, "Reports of Progress in Equal Employment Opportunity," May 15, 1973, Joseph R. Wright to Robert W. Long, "Progress in Equal Employment Opportunity, September 5, 1973, Ibid.

[24] Joseph R. Wright, Jr. to Robert W. Long, October 18, 1974, "Civil Rights," Ibid.

[25] R. M. Davis to Robert W. Long, November 26, 1975, "Civil Rights," Ibid.

[26] R. M. Davis to Robert W. Long, November 26, 1975, Ibid.

[27] Statistics from employment data bases, Personnel Division, SCS, Washington, DC.

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Small Watersheds and the USDA: Legacy of the Flood Control Act of 1936

Reprinted from Rosen, Howard, and Martin Reuss, eds. *The Flood Control Challenge: Past, Present, and Future.* Proceedings of a National Symposium, New Orleans, Louisiana, September 26, 1986. Chicago: Public Works Historical Society, 1988. pp. 67-88.

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The Flood Control Act of 1936, followed by the Flood Control Act of 1944 and the Watershed Protection and Flood Prevention Act of 1954, made the U.S. Department of Agriculture (USDA) one of the federal participants in flood control work. The act initiated the most thorough examination yet of agriculture's relationship to flooding. The period of study and investigations of watersheds springing from the 1936 act affected the structure of future water resources programs in USDA. The experiences of the earlier period were incorporated in the provisions of the 1954 act, the legislation under which most of USDA's flood control work has been carried out.

While this paper will not concentrate on individual projects and field activities in flood control, a general idea of the programs that resulted from the process begun in 1936 will help in understanding the events of the intervening years. The Agriculture Department's small watershed program, as it has come to be called, is generally limited to upstream tributary watersheds of less than 250,000 acres. Many of the projects have utilized combinations of floodwater-retarding structures, channel modifications, and other engineering works to reduce flooding along streams. The department has generally provided financial assistance for these aspects of flood control projects. USDA also offers assistance, often a technically trained soil conservationist, to help apply conservation practices on farm and ranch lands in the watersheds above the structures.

In the parlance of USDA the former type of assistance is called flood prevention and the latter, watershed protection. In addition to flood prevention, most projects involved additional purposes. Drainage has been involved in 22 percent of the projects, recreation in 19 percent, municipal and industrial water supply in 12 percent, fish and wildlife habitat enhancement in 7 percent, and irrigation in 7 percent. Since the Flood Control Act of 1944, the department has been involved in 1,387 projects covering more than 87 million acres.

The nature of these projects has been shaped to a certain extent by the results of scientific research and technological developments. To an equal or greater degree they have been influenced by attitudes--attitudes about the interrelationships of land cover, soil erosion, and flooding; attitudes about the most desirable working relationship between federal, state, and local entities; attitudes about who should benefit from and who should pay for flood control projects; and attitudes about small watersheds in comprehensive river basin planning. Such attitudes influenced the flood control legislation for upstream work. But the legislation left leeway for administrative decisions. Thus, changes in attitudes on how the program should be operated have been important and likely will continue to influence the program.

Underlying the decision to have a flood control program in the headwaters, the upstream tributaries, or the little waters was the belief that humans, through their activities, affect the frequency and severity of floods, especially by removing vegetation and inducing soil erosion and rapid runoff. Undoubtedly there are many ancient examples of this belief, but for an early American example the observations of the colonial naturalist John Bartram should suffice. He observed in New England that pasturing the woodland caused little hollows which "wear to ye sand & clay which it

bears away with ye swift current down to brooks & rivers whose banks it overflows."[1]

The question of the scientific relationship of forests and flooding entered the public policy arena in the late nineteenth and early twentieth centuries. Those who believed the relationship to be close felt that good forest cover regulated streamflow by enhancing infiltration. Watershed protection for water supply was a primary intent of the 1892 legislation that allowed the president to establish forest reserves from the public lands, reserves which became the core of the national forest system. The Weeks Act of 1911 permitted the purchase of lands in the East to establish national forests. The rationale that satisfied constitutional objections was that forest cover influenced streamflow; therefore the government could purchase watersheds under the power to regulate commerce. Watershed protection also played a part in Senator Francis G. Newlands' plans to legislate for a comprehensive water resources development program--plans that included, in part, forests and reservoirs as an alternative to levees for flood control. The U.S. Army Corps of Engineers particularly protested what they viewed as an overemphasis on forests and flooding. Thus, hydrologic theories became embroiled in the controversy over water development policy, and the debate gradually moved from the professional journals to popular magazines which could influence public opinion.[2]

The generation of young men then beginning their public service, who would head government programs during the New Deal, seemed more swayed by the land-cover advocates. President Franklin D. Roosevelt looked upon forests as beneficial to flood control. The Civilian Conservation Corps (CCC), a Roosevelt creation, would work on "forestry, the prosecution of soil erosion, flood control and similar projects." Concerned about public criticism of CCC work on private land, he insisted that such work be directed to solving flood control problems over broad areas rather than benefiting an individual parcel of land. Such an attitude revealed his faith in the value of forests in reducing floods.[3]

The Civilian Conservation Corps helped another new conservation agency, the Soil Erosion Service, later the Soil Conservation Service (SCS), begin its work. The CCC camps, as well as the Works Progress Administration labor, allowed Hugh Hammond Bennett to test his theories about soil conservation. Bennett, a career soil scientist in USDA, concerned himself mainly with the impact of soil erosion on loss of productive capacity, but he was not unmindful of the question of the relationship of soil erosion to flooding. Where soil erosion was prevalent, the floods covered fertile bottomlands with stones and infertile sand. Erosional debris reduced the capacity of stream channels and reservoirs. Particularly destructive floods could remove the fertile alluvium, leaving only stones, a condition which he said required levees or dikes.[4] But he also believed that there could never be "any far-reaching permanent flood control if erosion is not put under control over the watersheds feeding the streams of the nation." In addition to the troublesome results of sedimentation, soil erosion "speeded up runoff of surface water from bared slopes to accentuate flood peaks and to augment the cutting power of stream flow." The soil profiles that Bennett so loved to dig showed a difference in the nature of the alluvium deposited since European settlement. The variations reflected, Bennett believed, a change in the velocity of floodwaters.[5]

Bennett's chief of research, Walter Lowdermilk at the new Soil Erosion Service, had conducted some of the seminal studies on the relationship of forest influences on runoff. His travels in China brought him to the conclusion that the watersheds must be treated in the interest of flood control.[6] Naturally Bennett and Lowdermilk were interested in the effect of their soil conservation program on runoff and sedimentation. The soil conservation program for farmlands involved a myriad of interrelated and mutually supporting farming practices and mechanical and engineering measures. Among the plans for America's farmlands could be found terraces, grassed waterways, contour plowing, stripcropping, longer crop

rotations, and improved pastures and woodlands with controlled grazing to maintain a healthy ground cover. Soil conservationists came to call this package of measures land treatment. In addition to maintaining productivity and farm income, soil conservationists believed that land treatment on a watershed basis helped to reduce the height of floods in the small tributaries. As they began setting up watershed-based demonstrations, they also began to make provisions to measure the influence of land treatment on streamflow.[7]

Another influential New Deal figure who emphasized land treatment on farmlands as a part of river basin development was Morris Cooke. He had more influence with President Franklin D. Roosevelt than other advocates of the same idea. As administrator of the Rural Electrification Administration (REA), Cooke promoted the publication of *Little Waters: A Study of Headwater Streams and Other Waters, Their Use and Relations to the Land*, which was issued by REA, SCS, and the Resettlement Administration. In his presidential message transmitting the report to Congress, Roosevelt held that disastrous floods "originate in a small way in a multitude of farms, ranches, and pastures." National plans should not neglect major rivers in favor of the little waters, but the plans should "envisage the problem as it is presented in every farm, every pasture, every wood lot, every acre of public domain."[8] The Water Resources Committee of the National Resources Committee tried to counter what they regarded as a very unscientific view with their own publication *Low Dams: A Manual of Design for Small Water Projects* (1939). The slim volume received its due in hydrologic circles, but was no competition for Cooke's adept promotion of *Little Waters*.[9]

The question of land treatment and its value in flood control received a review from all points of view at the Upstream Engineering Conference in 1936. Abel Wolman spoke for the friends of soil conservation who believed that the concept was being called upon to do too much. He said, "The case for soil conservation and reforestation is so good of itself that one must naturally wonder why it should be ruined on the rocks of overstatement, overpromise, or undervaluation of scientific principles."[10]

The Upstream Conference, another of Cooke's ideas, was held three months after the passage of the Flood Control Act of 1936 to discuss implementation of one of the act's significant provisions.[11] The legislative journey of the Flood Control Act of 1936 began in response to the spring floods, but emerged as a national policy on flood control. To expand the national policy providing for "investigations and improvements of rivers and other waterways" to the entire hydrologic unit, an amendment on the floor of the Senate added the phrase "including watersheds thereof." The amendment also assigned authority to the secretary of agriculture for "investigations of watersheds and measures for run-off and water flow retardation and soil-erosion prevention on watersheds."[12] In submitting these amendments to the White House, Senator Carl Hayden of Arizona had characterized them as "showing how I think the flood control bill should be amended to conform with the president's message on *Little Waters*."[13] With the support of the White House, the amendments were included in the final bill.

In addition to Joseph Arnold's excellent analysis (in *The Flood Control Challenge: Past, Present, and Future*, edited by Howard Rosen and Martin Reuss) of the complicated sequence of events leading to the passage of the act, one other factor should be mentioned. Earlier Hayden and other Arizona politicians had sought the assistance of SCS in controlling floods on the Gila River. He went specifically to Walter Lowdermilk, assistant chief of the Soil Conservation Service, whom he had known in Arizona. The plans for flood control, to which the downstream irrigators objected, included twelve floodwater detention dams along with land treatment on the upper Gila. Hayden thought the scheme should be applied to all upstream areas. He and Lowdermilk worked on national legislation and Hayden stood ready

to promote the upstream program in 1936 when the occasion arose.[14]

After Roosevelt signed the bill, Secretary of Agriculture Henry A. Wallace decided to neither assign responsibility to a single bureau in the department nor establish a large flood control office. The various bureaus would do the technical works while a small group in the secretary's office, the Office of the Land Use Coordinator, under Milton Eisenhower, would coordinate the work. The chiefs of the Soil Conservation Service, Forest Service, and the Bureau of Agricultural Economics formed an advisory committee.[15] The act left much to administrative decision, but it was generally understood that the Department of Agriculture would make a survey of flood and sediment damages, devise a remedial plan, and submit the plan to the president and then to Congress.

But the surveying and approval did not proceed quickly. Not until May 1940 did Agriculture Department officials believe they would be ready for the action part of the program. Field survey work had been completed on eleven watersheds, and these reports were undergoing technical review in the department. After three or four surveys had been coordinated with the plans of the Corps of Engineers, it was anticipated that the reports would be submitted to the president for allocation of the $4 million already appropriated.[16] But it would be more than a year, October 1941, before USDA submitted a report on the Los Angeles River to Congress. After World War II interrupted the work, USDA reached an agreement with the Bureau of the Budget to concentrate on surveys nearest to completion and to suspend flood control work on July 30, 1943.[17]

By September 1944 the department had completed 154 preliminary surveys covering nearly 1.25 million square miles. Thirty surveys revealed insufficient benefits in flood control and sediment reduction to warrant detailed surveys. Of the 124 calling for detailed surveys, 18 had been completed and submitted to Congress for authorization. USDA recommended eleven of the watersheds be funded under the flood control acts. Of the remaining seven that did not have sufficient flood control benefits, USDA suggested that six should be funded under other authorities because the suggested program would benefit the watershed.[18]

Certainly Congress and the Department of Agriculture in 1936 envisioned some work in the field, not just completion of reports, after more than five years. In the history of flood control work in USDA, the delay is important for our consideration. One must wonder whether the history of flood control activities would have been different had the department managed to get surveys approved and to undertake field operations in a number of projects before the onset of the war.

The organizational structure of the flood control survey work probably was a major reason for the delay. The idea of coordination had not worked. Arthur Ringland, a career Forest Service employee who had studied headwaters control in Europe, served as chairman of the Flood Control Coordinating Committee of the Office of the Land Use Coordinator. After several years of dealing with the problems, without much authority, he stated that "the flood control program is the victim of institutionalism at its worst." To correct the "confusion and diffusion of responsibility," he said there should be a department-level official with administrative authority. The Forest Service and Soil Conservation Service should have "straight line undivided responsibility and authority for all flood control project work in the field of whatever character."[19]

The ill-advised organizational decisions accentuated the difficulties that naturally came with a new function. The 1936 act stated that benefits should exceed costs. Some work had been done on evaluating on-farm conservation measures, but the department had a new task in evaluating the downstream or off-site benefits.[20]

There was another need for information and analysis--the need for hydrologic

information for the small watersheds. In late May 1936, less than a month before the passage of the flood control act, the National Resources Committee published "Deficiencies in Basic Hydrologic Data," which called attention to the need for information on rainfall and runoff to support government programs. Ringland lamented, then and later, that USDA delayed too long in enlisting the Weather Bureau's cooperation in acquiring information on the intensity and duration of rainfall in small watersheds. When called upon to comment on the flood survey reports, the Weather Bureau repeatedly emphasized that more data were needed in order to evaluate the flood potentials.[21]

Looming over and complicating the technical and organizational details were the various institutional and political opinions and rivalries on what constituted an upstream program. The Bureau of the Budget, which advised the president on approval of flood control projects, believed that flood control authorities should not be used to fund conservation measures when the Department of Agriculture already had authority under the Soil Conservation Act of 1935. The Bureau regarded such work as an intensification of the regular soil conservation program. The Bureau of the Budget prevailed, at least temporarily, in that opinion when the Flood Control Act of August 18, 1941, restricted expenditures by USDA to "works of improvement which the Department is not otherwise authorized to undertake."[22]

Other differing opinions were being fought out in the flood control survey approval process. Not all of the participants were from the federal agencies. States, particularly those with water resources agencies, looked to the new legislation as a means to help finance their flood control plans. The Oklahoma Water Resources Board under the energetic leadership of Don McBride had already devised a plan for controlling floods on the Washita River. Forsaking any dams on the main stem of the river, the plan called for twenty-five reservoirs on the tributaries. McBride believed that such a system would best protect and retain the valuable bottom land.[23] Since flood control surveys by a federal agency were a prerequisite to financial assistance, Oklahoma would have them--one each by the U.S. Army Corps of Engineers, the Bureau of Reclamation, and the Department of Agriculture.[24] As the surveys proceeded, McBride was already prepared to speak for the Washita folks in saying that "We are all agreed that we need the dams on the tributaries of the river to protect our fertile farm lands and our towns."[25] McBride believed that he had succeeded in getting the new water resources agency, the Department of Agriculture, to accept the plan. But on a trip to Washington in 1940 he found that the "reservoir section had been taken out of the Washita Report."[26] While some in USDA and SCS would have accepted the role of assisting Oklahoma, the Office of the Land Use Coordinator, especially Arthur Ringland, viewed reservoir building as outside the purview of the department's charge under the 1936 act.[27] Such starts and reversals did delay the approval of surveys as various attitudes about what an upstream program should be were debated.

In the Flood Control Act of 1944, Congress authorized eleven projects that USDA had submitted to Congress between 1941 and 1944. Work would not begin until after the war was over. These projects, most of which are still active, would be the only department projects authorized under the procedures of the Flood Control Act of 1936. But experiences from the project planning and implementation would be the model for future USDA flood control activities.

While there was understandable disappointment over the progress of completing and approving reports, the period of study had profound influence on the future of flood control work. The studies had added a new understanding to the relationship of land treatment to floods. One of USDA's hydrologists on the flood control work, Howard Cook, believed that the effects of land treatment on flooding involved some of the most difficult problems in hydrology and that the surveys "did a great deal to dry up

the source of this controversy by making possible hydrologic and economic studies of unprecedented scope and intensity."[28] Field and plot studies often showed dramatic increases in infiltration on pasture and woodland compared to bared land. But the field- and plot-sized results could not be extrapolated to an entire watershed. On thin soils, floodwater came from subsurface, as well as surface, runoff. Thus, land treatment measures to enhance infiltration had limitations in preventing floods. It was true that watershed characteristics had an influence on flooding, but vegetation and land treatment were only part of the characteristics. The combined hydrologic and economic studies found that watershed treatment reduced flood and sediment damages by as much as 40 percent in some cases, but as little as 5 percent in others. Generally the benefits of conservation practices to increased income exceeded flood and sediment damage reduction benefits of the program. The flood control benefits, according to the surveys, were not what many might have expected when the 1936 act was passed.[29]

However, another revelation of the surveys augured well for an upstream flood control program. The analysis showed that the crop damages in the numerous tributaries from frequent flooding far exceeded the agricultural damages in the wide alluvial plains of the rivers. The implication was that while the control of floods in upstream tributaries had limited influence on floods of major rivers, a small watershed program of flood prevention had considerable economic value.[30]

After the war the Department of Agriculture began receiving appropriations to resume flood surveys and to begin work on the eleven authorized projects. Also, the Soil Conservation Service began writing sub-watershed work plans, plans of actual work, for the approved watersheds.[31] In these sub-watershed plans, especially those in the Washita, Trinity, and Middle Colorado in Oklahoma and Texas, SCS planned to install what were categorized as "small upstream floodwater retarding structures for temporary storage to regulate storm runoff and reduce peak discharges."[32] By mid-1949 they had completed some twenty-five of these structures. Completed sub-watershed plans included another 410 structures which could store 227,385 acre-feet of water.[33] When this matter came to the attention of the solicitor in the Department of Agriculture, the ruling was that SCS did not have authority to build such structures.[34]

This development was related to the manner in which the reports were approved. The approved congressional documents outlined a general plan of remedial action, but were not written in legal language. Thus, the reports were subjected to a great deal of interpretation as to what activities had actually been approved for federal expenditures. Within the Agriculture Department, the solicitor held that the congressional documents did not approve floodwater-retarding structures. To correct this problem, USDA and SCS went before the agriculture subcommittee of the House Committee on Appropriations and requested an amendment. In their prepared statement, the Soil Conservation Service had to, if not deny, at least deemphasises the value of land treatment for controlling floods. SCS told the committee, "Our experience to date indicates that the works of improvement originally authorized to be installed by this department in the eleven approved watersheds are inadequate to control the movement of water from the watershed lands until it reaches the points where the Corps of Engineers take over."[35] The subsequent amendment to the appropriations bill allowed funds to be spent on "gully control, floodwater detention, and floodway structures."[36] In this manner, without debate in Congress, and without comment by the U.S. Army Corps of Engineers or the Bureau of the Budget, SCS secured authority for building floodwater-retarding structures.

Undoubtedly, the clarification of this issue by including floodwater-retarding structures in the upstream program was a seminal point in the history of the Agriculture Department's water resources program. Without the more structurally oriented program, the Soil Conservation

Service would have had great difficulty in differentiating land treatment under the flood control act from the agency's other field work under the Soil Conservation Act of 1935. Conserving topsoil retained its primary place in the conservation mission, but there had been a trend, almost from the beginning, to include upstream structures in the program. The Soil Conservation Service's work with CCC camps had involved some small reservoir construction. As Lowdermilk's plans for the upper Gila indicated, some elements in the Conservation Service were not averse to including floodwater-retarding structures. Even before the passage of the 1936 act, the research division of SCS had expanded its runoff studies from plots to natural watersheds.

By the late 1930s there was sufficient sentiment in SCS in favor of combining the structures with land treatment to include them in the reports to Congress. But at the departmental level, in the Office of the Land Use Coordinator, such plans were blocked, mainly due to the objections of its head, Milton Eisenhower.[37] That the Department of Agriculture did not include floodwater-retarding structures in the flood control surveys was more a matter of choice than a lack of authority under the 1936 act. The bill simply made USDA responsible for "measures for run-off and water flow retardation and soil-erosion prevention on watersheds." Stymied at the departmental level, SCS tried for more direct authority. An agency-initiated Senate bill (S. 1812) in 1944 would have authorized Agriculture Department flood control plans to include "structures for the catchment and detention of flood waters or sediment which shall not exceed a cost of $100,000 for any single structure." The bill would have circumvented any coordinating groups by providing that the secretary would "administer the provision of this title through the federal agency known as the Soil Conservation Service."[38] The bill did not pass, but after the war there was no need for it. SCS no longer had to report through the Office of the Land Use Coordinator. Under Clinton Anderson and Charles Brannan, the attitude of the secretary's office had changed to one that was more receptive to flood control in rural areas as part of the Agriculture Department's mission.[39]

Now that the Soil Conservation Service had legislative authority to include flood control structures in the eleven authorized projects, the proponents of this type of USDA/SCS program could look forward to a favorable reception for their inclusion in other projects to be authorized by Congress under the provisions of the 1936 act. This, however, was not to be the future of the flood control program in the Department of Agriculture. After the war there continued to be difficulties in completing surveys and forwarding them to Congress. USDA seemed about ready to submit several plans to Congress in 1949, when the secretary's office issued an amendment to the procedures calling for revisions in the economic analysis.[40]

There were other factors leading to delay and an impasse. Under Secretary Charles Brannan, the Agriculture Department was emphasizing comprehensive river basin planning with the flood control surveys as a part of the process. The department made surveys in the Missouri and Columbia basins a priority. Another disagreement within the department involved the flood control structures, which SCS favored, while the Bureau of Agricultural Economics and the secretary's office wanted the surveys to include money for land treatment as part of a comprehensive watershed project.[41] The Bureau of the Budget continued to object to the land treatment aspects of the flood control projects that could be carried out under USDA's regular conservation program. In this attitude they were, perhaps unwittingly, the allies of some in SCS who had wanted a greater emphasis on structures to control floods.[42]

Finally, there were problems with Congress. The Flood Control Committee, whose duties passed to the Public Works Committee under the Legislative Reorganization Act of 1946, had authorized the eleven survey reports. Originally, funds for the surveys had gone through the War Department to

USDA. After the war, the agriculture subcommittee of the Committee on Appropriations began handling the funding requests. The situation was almost bound to create confusion. Who would now authorize additional projects, the Agriculture or the Public Works Committees USDA submitted survey reports to both committees (page 106). Some members of the Public Works Committee frankly thought they detected "a perversion of the intent of the flood-control acts" to carry out the regular USDA conservation work "under the guise of flood control."[43]

However, it was not just the differing opinions within government involved in the stalemate over the Department of Agriculture's flood control surveys. Out in the countryside, what was known as the upstream-downstream debate was at full force. The big dam-small dam controversy raged in the Arkansas-Red-White Basin and the Missouri Basin for some understandable reasons related to climate and topography. The Washita River, one of the projects authorized in the 1944 act, for instance, presented a good case for the small dams. Clouds, swept up from the Gulf of Mexico, provided moderate annual rainfall, but rainfall often was delivered in thunderstorms. Geologic forces created an area of moderate relief with wide flood plains, which, when protected from the very frequent floods, were much preferred for cropland over the adjacent, more droughty slopes and crests. Advocates of small dams on the tributaries argued that a series of small dams would protect the valuable bottom, while large dams would inundate too much of it. Partisans of the upstream program trekked to see the small structures along the Washita. The concept represented by the Washita was the model lauded in the major proselytizing treatise of the era, *Big Dam Foolishness* (1954) by Elmer T. Peterson, an Oklahoma journalist.

The Washita-type program, of course, involved many hydrologic questions. The point at issue was no longer simply the effect of land treatment on flooding. Now it was a question of the value of a system of small dams, or the effects of the small dams on the function of the corps' larger dams. Could a system of small dams be substituted for larger dams? Some of the upstream forces advocated a system of land treatment and small reservoirs as an alternative to large downstream flood control structures. People who would lose farmland to the large reservoirs found this a particularly appealing idea.[44] While the Agriculture Department did not publicly promote this flood prevention program as the answer to downstream flooding, the Public Works Committee believed SCS was supplying the upstream forces with information which was misused and exaggerated in the debate.[45]

The Corps of Engineers began to voice objections that Soil Conservation Service small structures in the eleven authorized projects had not been coordinated with their work. But their primary objection was that such a program would call for another engineering agency, and that Congress should not create another agency. The upstream territory, like the downstream, would be theirs if there was really a need.[46]

The result of all this controversy was an impasse in the authorization of additional USDA flood control projects. According to Arthur Maass, two events broke the impasse and led to an entirely different method of approving watershed flood control work. One event was the election of an administration which was not wedded to the comprehensive planning and implementation of land treatment and flood control work. The other event was a congressional election in Kansas that alerted the administration to the desire of people in the headwaters for a small watershed program.[47]

Farmers and other residents had been lobbying for an upstream program, with some communities, especially in Kansas, forming watershed associations. The proponents had testified in 1951 before the subcommittee handling the Missouri Basin Agricultural Plan that they should not have to wait for complete river basin development to implement a small watershed program. The chairman of the subcommittee introduced a

small watershed bill, but that bill did not reach the floor because Public Works Committee members stopped it in the House Rules Committee.[48] Kansas, along with the rest of the Missouri River Basin, was, in the early 1950s, debating the virtues of a proposed Missouri Valley Authority modeled after the TVA, as opposed to the Pick-Sloan plan, a combination of the U.S. Army Corps of Engineers plan and the Bureau of Reclamation plan. Part of Pick-Sloan included the Tuttle Creek Dam on the Big Blue River in Kansas to help protect Topeka, Lawrence, and Kansas City from flooding.

When the Missouri Basin Commission held hearings in Kansas in the summer of 1952 to gauge public sentiment, Bureau of the Budget observers found "a real and growing resistance and resentment toward the Pick-Sloan big dam approach as the solution of all the problems of Kansas."[49] With the cities still pressing for the Tuttle Creek Dam, the nature of the opposition in the valley of the Big Blue River became obvious when Howard S. Miller, a seventy-three-year-old farmer from Morrill, captured the normally safe Republican congressional seat in the 1952 elections.[50] Miller, who had campaigned almost exclusively on the issue of the dam, failed to stop it and lost the next election. But his election had alerted the new Republican administration to the desires of rural people for a small watershed program. After a change in administrations, Congress in 1953 authorized a $5 million "pilot" program on sixty-two watersheds. The following year Congress passed the Watershed Protection and Flood Prevention Act. Amendments to the act have made it possible to construct works for drainage, irrigation, fish and wildlife development, and municipal water supply.

Within the Agriculture Department the flood control work expanded rapidly after the passage of the 1954 act. The Forest Service cooperated on the forestry aspects of projects. Its work on private lands increased. Within SCS the new surveying, planning, engineering, and construction supervision in watershed protection and flood prevention grew to claim a partnership role with the soil conservation operations.

The influence of the activities carried out under the 1936 act in shaping the watershed protection and flood prevention program was obvious. Subjection of long-held assumptions to scientific inquiry created a coterie of believers in small floodwater-retarding structures and channel improvement as a part of the upstream program, and they prevailed in having these included in the program. Land treatment to help infiltration and to protect reservoirs from sedimentation was included in the plans for the watershed. But traditionally, at least until recently, USDA has not shared the cost of land treatment under the Watershed Protection and Flood Prevention Act. The Bureau of the Budget attitude prevailed. Currently, the Agriculture Department and Congress are approving "land treatment watersheds," which are mostly long-term cost-sharing agreements for land treatment without the floodwater-retarding structures. Economic analyses during the 1930s revealed the costs of upstream flooding and provided the economic rationale for an expanded program. Under the 1936 act survey parties designed a remedial project unique to the area. This procedure had a certain rational appeal; it left leeway for a greater number of objectives in project design. But project approval accelerated after the experience gained during the 1930s and 1940s was digested and used to write guidelines and criteria under which small watersheds would be examined for approval.

The agricultural interests had pressed for the program, and most of the projects were sent to the agriculture communities for approval. Projects that would benefit agricultural land received a more sympathetic hearing than those to reduce urban flooding. The new program had decreased emphasis on total river basin planning. After determining that a proposed project qualified under the laws and regulations, the willingness and ability of the local community and the state to pay was the crucial test. The map of the small

watersheds projects reflected areas where the state and local community thought they had upstream flooding problems and were willing to pay their share to correct the problems.

Finally, there is the influence of the act on the Department of Agriculture and on the Soil Conservation Service in particular. The inclusion of a strong water resources program in SCS certainly broadened the base of disciplines. Hugh H. Bennett and Walter Lowdermilk viewed soil conservation as an interdisciplinary undertaking and included the many disciplines in the formative years. The water resources activity brought more hydrologists, engineers, geologists, and economists into the combined soil and water program than might have been expected. In response to the controversies arising from complying with the National Environmental Policy Act, more biologists were added. Furthermore, the method of planning and implementation under the flood control acts provides a basis, if not to ensure that each discipline participate in the joint soil and water conservation effort, at least to encourage such participation.

If there is a lesson for the future here, we should consider this aspect of the history. Currently, two of the important resource questions are ground-water quality and the off-site impacts of erosion and the contributions of agriculture to those problems. Both of these are highly complex scientific problems with complex solutions. The lesson from the experience under the Flood Control Act of 1936 was not to be too quick to extrapolate information from a field or experimental plot to an entire watershed, and that an interdisciplinary approach was needed to study the problems. That lesson should be borne in mind when confronted by other resources problems demanding understanding and calling for corrective measures.

Watershed Reports Submitted to Congress After World War II

(These reports were not authorized for works of improvement in flood control acts.)

Watersheds	Date Submitted	Referred to H. Committee	House Doc. Num.
Missouri River Basin	9/29/49	Ag.	373, 81/1
Green River, KY & TN	10/19/51	Pub. Works	261, 82/1
Grand (Neosho) River, OK	2/27/52	Pub. Works	388, 82/2
Brazos River, TX	3/10/52	Pub. Works	396, 82/2
Pee Dee River, VA, NC & SC	3/10/52	Pub. Works	395, 82/2
Sny, IL	3/10/52	Pub. Works	398, 82/2
Queen Creek, AZ	3/10/52	Pub. Works	397, 82/2
Delaware River, NY, NJ, PA, etc.	3/19/52	Pub. Works	405, 82/2
Sevier Lake, UT	3/19/52	Pub. Works	406, 82/2
Scioto River, OH	3/19/52	Pub. Works	409, 82/2
Pecos River, NM & TX	5/20/52	Pub. Works	475, 82/2
*Salt-Wahoo Creeks, NE	7/03/52	Ag.	530, 82/2
*Blue River, NE & KS	7/03/52	Ag.	530, 82/2
*Upper South Platte, CO & WY	7/03/52	Ag.	530, 82/2
*Osage River, KS & MO	7/03/52	Ag.	530, 82/2
*Five Mile Creek, WY	7/03/52	Ag.	530, 82/2

* Submitted as one document entitled "Supplemental Report, Missouri River Basin Agriculture Program."

Source: Arthur Maass, "Protecting Nature's Reservoir." In *Public Policy*, vol. 5, edited by C.J. Friedrich and J.K. Galbraith (Cambridge: Harvard University Press, 1954), 106.

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Watershed Program: Unique and Flexible

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The crusade for soil conservation was linked first and foremost to the idea of maintaining the productivity of land for agriculture. But, those concerned with soil erosion on individual farms have long known the need for dealing with cumulative effects of soil erosion on the wider area--the watershed.

Before scientists began to measure such things, observers speculated that the conditions that created soil erosion also resulted in more rapid runoff of rainfall to streams. The sediment in streambeds reduced capacity, leading to more frequent floods. Sand deposited on small floodplains reduced their value as cropland or natural areas. Thus, the environmental conditions of the whole watershed began to deteriorate.

Most of the watershed activities of the Soil Conservation Service are conducted under the authorization of the Watershed Protection and Flood Prevention Act of 1954, except for 11 projects authorized in the Flood Control Act of 1944.

But even before this, farmers worked on watershed projects requiring group action under the provisions of their State soil conservation district laws. For example, during the 1930s, farmers in the Jones Creek Watershed in western Iowa found that dealing with some of the larger gullies required group action. In addition to conservation practices on the farmland, they needed earthen dams with concrete spillways to control gullies. The enrollees at a Civilian Conservation Corps camps working under the direction of the SCS built nine structures in the area to control large gullies.

After the passage of national legislation, the watershed work became a major activity in SCS, with a budget that was often more than one-third of SCS's total budget. The pressure from the countryside to pass the act was in large part an effort to develop flood control on the upstream watersheds.

Local groups sometimes promoted projects on these "small watersheds" as an alternative to larger, downstream structures that caused the inundation of farms and, in some places, whole towns. If the local people at times overestimated the cumulative value of many small structures for flood control downstream, the movement nevertheless included two important developments: The small projects involved a high degrees of local interest and involvement in planning, operation, and maintenance; and, the projects linked the notion of flood control to soil conservation work on the watershed lands.

Historically, watershed projects have had a wide variety of objectives such as flood control, land treatment, drainage, irrigation, municipal and industrial water supply, rural areas development, recreation, fish and wildlife enhancement, and water quality.

The breadth of the watershed project authorities leaves wide discretion for administrative decisions. Various administrations have seized on this and tried to shape the program to their own ends. The Kennedy and Johnson administrations of the 1960s emphasized rural development and recreational objectives that would bring additional income to rural residents, and working with communities and suburban areas.

During the 1980s, SCS and the U.S. Department of Agriculture established reducing soil erosion as their priority. Following that determination, SCS empha-

sized "land treatment watersheds," which provided financial assistance for conservation practices on the farms in the watershed and deemphasized structures for flood control. Newly approved projects include a mixture of land treatment and structural types covering the range of purposes found in the 1954 act.

Trends in national priorities also affect watershed programs when public funds are used. For example, environmental groups promoting retention of habitat for wildlife have focused on the effects of flood control and drainage projects.

Projects have usually provided a procedure for shared costs, with the government share providing assistance beyond the financial and technical abilities of the landowners in the watershed. When costs and benefits are analyzed, social and environmental aspects must be taken into consideration. At times, the analysis has been restricted too much to monetary benefits.

If the small watershed program is to remain independent, it needs to protect and promote the unique aspects that distinguish it from other programs managed by SCS. The small watershed program has emphasized planning. During recent decades, additional specialists, such as economists, landscape architects, sociologists, and cultural resource specialists, have been added to the interdisciplinary teams.

There is strong local involvement and interest in watershed projects, which benefit a number of people. These elements should help ensure that watershed projects fulfill their promise.

Bringing Federal Coordination to Snow Surveys

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by Douglas Helms,
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Daily, even hourly, the federal government is monitoring numerous aspects of the environment. Though not so well-known as satellite images or the daily weather report, stations in the mountains of the West keep track of the amount of snow. A major objective is to know the amount of runoff in the spring and summer. Snow surveying is part of the development of science in government, as well as the growing demand for information by individuals and businesses in the interest of economic growth. Also, snow has been one of the more striking examples of federal, state, and local cooperation. This article recounts the entrance of the federal government into the snow surveying field.

As agriculture and recreation expanded in the West, some individuals, universities, and companies began collecting information on winter snows so as to predict snowmelt runoff in the spring and summer. Of necessity these surveys were limited to the watersheds of immediate interest; the forecasts were directed to specific purposes such as irrigation, hydroelectric power, and predicting floods. The idea of coordinating snow surveys so that forecasts of spring runoff would be available for all the West may have occurred to many people, but Walter Wesley McLaughlin, chief of the Division of Irrigation in the U. S. Department of Agriculture's (USDA) Bureau of Agricultural Engineering (BAE) was in a position to promote the idea. A Nebraska native, McLaughlin had earned a degree in civil engineering at Utah State University in 1896 and an M.S. degree in soil physics and irrigation from the University of California at Berkeley in 1924. McLaughlin embarked on a career in irrigation engineering in 1904 in USDA while also teaching at Utah State University. In 1925, he became head of the irrigation division, which was in the Bureau of Public Roads before being transferred to the Bureau of Agricultural Engineering.

Since Utah was one of the pioneering states in snow surveying, McLaughlin undoubtedly knew about its value. From his headquarters in Berkeley, California, he followed the growth of snow surveying in the West and participated in some of the snow survey meetings in 1933 and 1934. By mid-1934, he had decided the time was ripe for getting the federal government involved. He sent his supervisor, Samuel Henry McCrory, Chief of the Bureau of Agricultural Engineering, a project proposal entitled "Snow Survey and Stream Flow Forecasting." McLaughlin had observed that neither the Weather Bureau nor the Water Resources Division of the U.S. Geological Survey was particularly active in snow surveying. The pioneers in snow surveying were the users and their allies in industry, public utilities, state agencies, and agricultural experiment stations. Viewing the vacuum, McLaughlin proposed "to set up at the proper time a snow survey project under the Bureau of Agricultural Engineering, believing it to be the logical agency to undertake this work and the best agency to make the greatest possible use of the information in the interest of agriculture."

According to McLaughlin, he was waiting for the perfect opportunity; the drought of 1934 provided it. In May 1934 he had an opportunity to explain the importance of snow surveys to Secretary of Agriculture Henry A. Wallace. He told Wallace how snow surveys could have helped farmers

adjust to the drought.[1] Also, McLaughlin saw the emergency employment programs under the Public Works Administration (PWA) and the Works Progress Administration (WPA) as an opportunity to expand snow surveys and provide a way for coordinated forecasting. The Great Depression and employment programs of the New Deal elicited hundreds of proposals for a more activist federal role in social and natural resources areas. Thus the economic conditions provided the climate in which the federal government expanded its responsibilities in numerous areas.

The Farm Bureau Federation endorsed McLaughlin's proposal in 1934, and he submitted a request for PWA funds for snow measuring stations, snow courses, shelters, equipment, and maintenance for the first year. Despite their inactivity to date, McLaughlin believed the Department of the Interior would make a similar request if USDA did not take the initiative.[2] McLaughlin specified mostly research projects in his proposal.

McCrory agreed that the drought and depression had indeed provided an excellent opportunity, but McLaughlin was taking the wrong tactic. The emphasis must be placed on actually providing forecasts to farmers and other water users, rather than on research.[3] McCrory knew how to spot opportunities. His agency was one of the smallest in USDA, and he had won a reputation for aggressively competing with larger agencies for funding. BAE had neither the manpower nor the large constituencies of agencies such as the Weather Bureau or the Forest Service.[4] In addition to the $36,000 requested from the Bureau of the Budget for research, McCrory requested $40,000 of the emergency drought funds from USDA for making snow surveys and forecasts.[5]

The Bureau of the Budget rejected both requests.[6] Having become a convert to the idea, McCrory pushed the issue. In November 1934 Secretary Wallace met with Harry Hopkins, head of the federal relief effort, to discuss money for snow surveys. Rather than having a large project at the federal level, Hopkins suggested requests for the snow survey work should come from the states through their regular procedure for requesting project approval.[7] Meanwhile, in late 1934 McLaughlin continued his campaigning in the West. The Association of Western State Engineers and the National Reclamation Association adopted resolutions calling on the Secretary of Agriculture to undertake a coordinated, comprehensive snow survey in the West. McLaughlin and his allies blocked moves to have the Weather Bureau and the Forest Service named as the agencies to lead the effort. They much preferred that the Secretary of Agriculture delegate the authority. In the interest of making sure that the Bureau of Agricultural Engineering was given the authority, McLaughlin reminded McCrory to keep the Secretary advised. "We must, however, put the matter up to the Secretary so he will be prepared for any move by Forestry or Weather Bureau. Forestry grabs at every thing all the time."[8]

Legislation

Having failed, at least temporarily, with the regular budgetary process and the emergency employment funds routes, the campaign now turned to the legislative process. Governor C. Ben Ross of Idaho wrote to U.S. Senator James P. Pope of Idaho to introduce him to McCrory.[9] McCrory kept the Secretary informed of these meetings and his activities to promote snow surveys.[10]

The western Congressional delegation was easily convinced of the need for snow surveys and requested funding in 1935. The Senate appropriations committee discussed the item, but did not include it in the bill submitted to the full Senate. They wanted to resolve the matter of who was going to be in charge of the snow surveys. Senator Frederick A. Steiwer of Oregon contacted Assistant Forester Earle H. Clapp and others in USDA, who told him that authority should be assigned to the Bureau of Agricultural Engineering. The amendment to the appropriations bill in the Senate gave BAE authorities and funding for "snow surveys and forecasts of irrigation water supplies."[11]

Designing the Program

Before the appropriations bill was signed on May 17, 1935, McLaughlin had already asked James C. Marr, a Division of Irrigation engineer at Boise, Idaho, to familiarize himself with snow surveys in the northwestern states.[12] McLaughlin travelled to Logan, Utah, to discuss snow surveys with George D. Clyde, a professor of engineering at Utah State University and head of Utah's snow survey effort. McLaughlin considered Clyde "the best informed man in the country on this subject." In addition to his expertise, Clyde already had "very pleasant contacts with other agencies," which would be crucial to the success of a cooperative snow survey effort.[13]

McLaughlin thought Clyde would be the only additional employee BAE would need for their new role in snow surveying. He would be a collaborator for two or three months each year. Marr would have general supervision of the snow survey work. Clyde and Marr worked on the general plan of action in early May, preparatory to visiting existing snow surveying operations and prospective cooperators. Clyde and Marr would locate the snow courses in the states selected for work the first summer.

Despite McLaughlin's original intentions, he also signed on James Edward Church to help get the cooperative snow survey program started in the summer of 1935. Church's interest in snow led him from his fairly obscure position as a classics professor at the University of Nevada in Reno to being the most renowned figure on snow surveying in the United States. Undoubtedly, it was a wise move to solicit Church's advice and to add his reputation to the cause. Unlike Clyde, who immersed himself in developing the structure of the program and laying out snow courses, Church conferred with officials in the various states and explored the areas where cooperation could be had. He talked to the hydroelectric power interests in Los Angles, the irrigators in the Imperial Valley, and the Forest Service and National Park Service people in Arizona. One of the cooperators referred to Church's "goodwill tour." Church liked the term and continued the tour at Marr's behest.[14]

Church was a willing cooperator. If he resented the fact that Clyde had a greater hand in designing the coordinated system, he did not betray it in writing to McLaughlin or Marr. Furthermore there was much in the operations of the new group to enhance his reputation. Church felt that the Weather Bureau had rebuffed his earlier efforts to prod them into developing a national system. Worse, some of the Weather Bureau people preferred snow stakes for measurement, rather than Church's snow courses and tube sampling. (McLaughlin's group would use Church's methods.) Finally, Church held that streamflow forecasting required engineering, rather than meteorological analysis. Accordingly, most of the recent conferences have been held with engineers rather than meteorologists.[15]

Early Decisions on Standardization

The survey was obviously going to rely on a great deal of cooperation. But McLaughlin believed some of the methods and equipment must be standardized. His group decided to spend their scant funds, $15,000, on equipment. A standard type would be selected and purchased in volume so as to reduce costs. His group well understood that experience in the field would lead to improvements and correction of defects. Nonetheless they intended to start out with established standards for the equipment and methods. They would use Church's method for snow cover measurements rather than the stake method. The former involved taking a core sample of the snow so as to measure volume and water content. The stake method simply measured snow depth without regard to density or water content. Another Church contribution, "the Mount Rose tube in its original form or as modified in Utah," would be used.[16] The scale to measure the weight of the snow sample would also be standardized. As two of the innovators of snow surveying equipment, Church and Clyde both had a personal interest in the writing of standards. During the first year the Bureau of Agricultural Engineering

purchased 150 sets of snow sampling equipment with half going to Marr and the other half to Clyde for distribution.[17] But when they received the equipment, Clyde and Church both had some objections. Church found a deficiency in the weighing mechanism; Clyde found fault with the sampling tube from Nevada. McLaughlin wryly noted that snow surveyors from Colorado had no difficulty in using the equipment, and attributed "some of the comments of Clyde and Church to a little prejudice. This is only natural, since we all have our weakness in this regard."[18] In addition to the snow sampling tubes and the weighing mechanism, the group also supplied skis and snow shoes in some cases.[19]

Organization

The absence of long-term data plus the need to emphasize the cooperative nature of the work influenced McLaughlin's organizational decisions. There would be regional offices, rather than a national one. Without historical data, personal knowledge of the rivers and streams would be required if the snow survey group expected to make worthwhile forecasts in the first few years. They needed, and wanted, to make their presence known. They definitely planned to make forecasts from the new snow course data the first year. After some years' accumulation of data, McLaughlin believed it would be possible to have a national office. But there was another reason for regional structure. McLaughlin wanted to have the state agencies involved not only in the surveying, but also in the forecasting. The matter of organization illustrated the sensitivity required in federal-state cooperation on the project and how such cooperation could best be achieved. McLaughlin thought his bureau should insist on being involved in all local forecasting. He wrote to McCrory, "Otherwise the work would soon drift out of our hands and we would find ourselves in a position of supplying funds and some state agency making the forecasts."[20]

Establishing Snow Courses

The first year McLaughlin planned to expand existing networks in the key drainages and the most accessible areas of Oregon, Idaho, Utah, Wyoming, Colorado, Nevada, and California. As Clyde and Marr travelled about, locating snow surveys, they were "to interest local and state agencies and stimulate an interest in local agencies for snow surveys so they will demand the work."[21]

McLaughlin's group hoped, and suggested, that the cooperators in Nevada, California, Utah, and Oregon who already had extensive networks of snow courses would establish additional ones as well as surveying and mapping existing courses. BAE was to supply the additional snow surveying equipment needed. During the summer of 1935, Marr concentrated on the Snake River and Clyde on the Colorado in establishing new snow courses in Wyoming, Idaho, and Colorado.[22] In selecting the new snow courses, the two considered serviceability, accessibility, and the key areas in a statewide plan, as well as the most urgent requests from cooperators.[23]

During the first ten days of August, 1935, Marr covered 2,300 miles over little travelled roads and trails as he established snow courses in Wyoming and Yellowstone National Park. To avoid the cost of installing a course, he selected areas where little construction work would be needed. Where work was needed he managed to get the cooperation of the Civilian Conservation Corps. Thanks to the cooperation of agencies, the only cost to BAE would be the snow sampling equipment.[24]

Marr's enthusiasm for the work even brought a reaction from McCrory in Washington. He advised McLaughlin to "put on the brakes on a little in his case. He is working so hard that I am afraid he faces a nervous breakdown if he does not ease off somewhat."[25] At the end of 1935, Marr thought the snow surveying group had about a fourth of the 1,000 courses they would eventually need.[26]

Cooperation with Other Federal Agencies

McLaughlin believed the Forest Service, as part of their cooperation, would clear and mark courses, build and equip snow shelters at their own expense and with CCC labor.

He hoped that some of the cooperating state agencies such as the state engineers would be able to use CCC labor and successfully apply for Federal Emergency Relief Act funds for similar work. McLaughlin planned to use all of the scant $15,000 appropriation for equipment. To establish the whole network in the West would eventually require about $100,000 to $300,000.[27]

The Division of Irrigation group never quite secured the large allocation of emergency funding with which to rapidly expand the network by clearing snow courses, building snow cabins, and doing other construction work. Thus they tended to work through the states or with the federal land management agencies. Marr helped Idaho prepare applications for funds to work on snow courses.[28] The federal land management agencies eventually did much of the construction on the lands in their charge. Seeing that BAE had only $15,000 to get the work started, the other agencies knew well that success depended upon their cooperation. Evan w. Kelly, the U. S. Forest Service's regional forester in Missoula, Montana, wrote to his forest supervisors: "The Bureau of Agricultural Engineering is pitifully short of the necessary appropriation from which to finance this important activity;...the various agencies of the Government directly or incidentally interested, must cooperate to the fullest practical extent."[29] The Bureau of Agricultural Engineering had reason to be pleased with the degree of cooperation the first year. They wrote not only to cooperators, but also to their supervisors thanking them. Success the first year accelerated the degree of cooperation. The Corps of Engineers had been doing some snow surveying work on the watershed of the Missouri River. In 1936 they contributed $3,000 so that BAE could set up courses on the Columbia River basin.[31]

Expansion of Work

Following the forecasting work in the spring of 1936, BAE expanded the program in the summer. In all the states there was cooperation with the state engineer and the land-grant agricultural college. Each of the district representatives of the Division of Irrigation made arrangements for the snow cover surveys, provided the equipment, and stocked the cabins. Essentially they handled all of the operations in their state. They reported the snow survey data to the Berkeley office and the Boise office. Clyde handled the work in Utah while Church handled Nevada. Marr, at Boise, and Louie T. Jessup at Yakima, Washington, did Idaho and part of the Columbia drainage. Ralph Parshall at Ft. Collins was responsible for Wyoming and Colorado; and temporarily responsible for New Mexico and Arizona. Arch Work surveyed Oregon and northern California from his office at Medford, Oregon. The state engineer of California did the rest of that state. The district engineer of the U. S. Geological Survey at Helena, Montana, did the Missouri River. The Berkeley and Boise offices jointly publicized the information.[32]

By the second season they had perfected the publicity arrangements. They made measurements monthly from January 1 to May 1. Water supply forecasts were made following the February measurement and the April or May measurement, depending on the state. Broadcasts of information went out on the Farm and Home Hour and various state stations. The cooperating agencies, usually the state engineer or the state agricultural college, put out mimeographed releases. The Weather Bureau also published the data for the federal government. As part of the original agreement with the Weather Bureau, BAE supplied information to them for flood predictions. Sampling for flood predictions required additional visits to the snow courses. The snow survey work was actually a part-time duty for the BAE people, except Marr, who would work full-time on it until no longer needed.[33]

Winter Sports Radio Broadcasts

By the second year of forecasts, the snow survey group began receiving requests for information from winter sports enthusiasts. McLaughlin wanted to get immediately involved since it was a public service and was another "most worthwhile public contact for us...."[34] Initially McCrory resisted,

believing that BAE had to strictly limit itself to the authority in the legislation for forecasting irrigation water.[35] Never easily discouraged, McLaughlin managed a meeting with Paul Appleby, Assistant to the Secretary of Agriculture, and got his endorsement. Following the meeting with Appleby, McLaughlin worked out an agreement with the National Broadcasting Company to devote five minutes each Friday on the Farm and Home Hour to reports from each state. Also, many of the state weather bureaus and state highway departments agreed to issue the forecasts. As far a McLaughlin was concerned the service was "an excellent contact with the public."[36]

Different Visions

The issue of the winter sports forecasts illustrated some of the differences in outlook, or zeal, between McCrory and his people in the West. McCrory saw the value for irrigated agriculture and strongly supported the work, but he saw it as only one aspect of BAE's work. When he thought he detected Marr and others working exclusively on the snow survey project, yet charging a large part of their salaries to other accounts, he chided them. He warned McLaughlin to stay within the appropriation for snow surveys and vowed not to siphon funds from other work for it.[37] He wanted to adhere strictly to the authorization for predicting irrigation water supplies. As far as he was concerned, the agreement with the Weather Bureau was well understood by both parties, and each group would cleave honorably to the agreement.

In practically all these matters, McLaughlin had a different view. Success in the snow survey required a quick success the first year and thus demanded almost undivided attention. Though an irrigation engineer by training, he understood the other uses and potential for the snow survey and moved aggressively into those areas. Given the sparse BAE staff in the West, compared to other Federal agencies, McLaughlin cherished the publicity value and resulting clout that came from activities such as the winter sports radio broadcasts. McLaughlin's operation depended upon the cooperation of the land management agencies, but he also viewed them as potential competitors for the snow survey prize. In his opinion the Weather Bureau had to be watched at every turn. Offers of cooperation must be analyzed closely for ulterior motives.[38] For all these reasons McLaughlin and his people in the Division of Irrigation zealously set out to make the program a success.

Summary

More than fifty years after federal coordination of snow surveys was begun, its value is recognized more than ever. The competition for water in the West due to the explosion in population, industry, and agriculture created a demand to know as precisely as possible the amount of water available from snowmelt. The various enterprises whose operations cut across political boundaries demand the basinwide information that a coordinated system produces.

In retrospect, many of the decisions made by McLaughlin and his colleagues were wise beyond their time. One thing they wanted, but did not get, was a large appropriation or allotment from the emergency employment funds to rapidly clear snow courses, build snow cabins, and do other types of construction associated with snow surveys. Would this have changed the course of the history of snow survey? It is difficult to know. As it developed, the enforced reliance on the state and other federal agencies to do much of the work probably was beneficial to the strength of the program. Although the snow survey is operated under the Soil Conservation Service, it is responsible to, and draws strength from, all the cooperating agencies. In a sense it has a separate existence. The users and gatherers of the snow survey information seem likely to continue to demand some coordination at the federal level for the foreseeable future.

Endnotes

[1] Walter Wesley McLaughlin to Samuel Henry McCrory, July 25, 1934, File 3-234,

General Correspondence, 1931-1939, Records of Bureau of Agricultural Engineering, Record Group 8, National Archives and Records Administration, Washington, D.C. All of the correspondence cited in this article is from the same file.

[2] McLaughlin to McCrory, August 6, 1934.

[3] McCrory to McLaughlin, August 23, 1934.

[4] Wayne Rasmussen, former historian of USDA, knew McCrory and provided this characterization. Conversation with Rasmussen, March 25, 1991.

[5] McCrory, Memorandum for the Secretary, September 4, 1934.

[6] McCrory to McLaughlin, November 18, 1934.

[7] McCrory to McLaughlin, November 27, 1934.

[8] McLaughlin to McCrory, December 8, 1934.

[9] C. Ben Ross to James P. Pope, December 27, 1934.

[10] McCrory, Memorandum for the Secretary, January 31, 1935.

[11] U. S. Congress, Senate, *Congressional Record*, 74th Cong. 1st. sess., 1935, 79, pt. 5: 4699.; Public Law No. 62, 74th Congress.

[12] James C. Marr to M. R. Lewis, April 26, 1935.

[13] McLaughlin to McCrory, May 6, 1935.

[14] James Edward Church to McLaughlin, July 23, 1935.

[15] Quotes of a letter from Church to McLaughlin found in McLaughlin to McCrory, August 9, 1935.

[16] McLaughlin to Church, August 3, 1935.

[17] McLaughlin to George R. Boyd, Acting Chief, Bureau of Agricultural Engineering, August 3, 1935.

[18] McLaughlin to McCrory, January 23, 1936.

[19] Mc McLaughlin to McCrory, October 19, 1935.

[20] McLaughlin to McCrory, December 30, 1935.

[21] McLaughlin, Memo--Snow Surveys, July 5, 1935.

[22] Marr to H. P. Boardman, August 12, 1935.

[23] McLaughlin to McCrory, December 30, 1935.

[24] Marr to McLaughlin, August 12, 1935.

[25] McCrory to McLaughlin, August 12, 1935.

[26] McLaughlin to McCrory, December 30, 1935.

[27] McLaughlin to McCrory, May 6, 1935.

[28] Marr to H. P. Boardman, August 12, 1935.

[29] Evan W. Kelly to Forest Supervisors, July 24, 1936.

[30] McLaughlin to McCrory, August 12, 1936.

[31] McLaughlin to McCrory, August 10, 1936.

[32] McLaughlin to McCrory, January 23, 1937.

[33] McLaughlin to McCrory, January 23, 1937.

[34] McLaughlin to McCrory, February 3, 1937.

[35] McCrory to McLaughlin, February 6, 1937.

[36] McLaughlin to McCrory, July 13, 1937.

[37] McCrory to McLaughlin, January 6, 1937 and January 18, 1937; McLaughlin to McCrory, January 12, 1937.

[38] McLaughlin to McCrory, December 21, 1936, McLaughlin to George R. Boyd, Acting Chief, Bureau of Agricultural Engineering, August 16, 1937.

Snow Surveying Comes of Age in the West

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Presented at the Western Snow Conference, Jackson, Wyoming. The author thanks David Balentine (volunteer), Anne Henderson, J. D. Ross, and Jon G. Werner of the Soil Conservation Service for their assistance.

Snow surveying and water supply forecasting entered a new era when the U. S. Department of Agriculture abolished the Bureau of Agricultural Engineering and transferred the Division of Irrigation to the Soil Conservation Service (SCS) on July 1, 1939. The Division of Irrigation was headquartered at Berkeley, California, with Walter W. McLaughlin as chief. The irrigation engineers in field offices in the western states had been in charge of the federal coordination of snow surveys since the U. S. Congress appropriated money for the work in 1935. Previously existing networks, such as those in Nevada, Utah, and California continued under the agricultural experiment station or a state agency as was the case in California (Helms, 1991). The individuals who eventually came to be called snow survey supervisors were James C. Marr in Boise, Idaho, R. A. "Arch" Work at Medford, Oregon, Ralph Parshall in Fort Collins, Colorado, and Lou T. Jessup at Yakima, Washington. They generally operated independently, though Marr was the acknowledged leader. Since the beginning of snow surveys, Marr had devoted all of his working hours to building up the snow surveying activities and had dropped his irrigation work (Marr correspondence).

The early years had been a time of rapid expansion--laying out snow courses, working out agreements with cooperators and users, compiling data, making forecasts, and reproducing the forecasts for distribution. Arch Work recalled that the group had decided working independently was the most efficient operation.

> We were pretty decentralized. I understand perfectly the need to centralize snow survey work under SNOTEL....But in those early days, we believed it was more practical and more profitable, in terms of public relations, to decentralize. I think it was a profitable position to take because they weren't restricted by regulations superimposed upon them by someone who didn't know very much about the business (Work interview, 1989).

The group created enough interest that the requests for additional snow courses eventually exceeded the meager appropriation and manpower available (Work interview, 1989; Marr correspondence).

The move to the Soil Conservation Service increased the area covered by snow courses as well as the application of forecasts (Work, 1989). The Soil Conservation Service had begun in 1937 to encourage the creation of conservation districts under state law. The districts had locally elected supervisors and directors. After a district signed a cooperative agreement with USDA, the Soil Conservation Service would assign staff to work with the district. The move added a large number of SCS employees as potential snow surveyors. Also, snow survey offices were opened at Reno, Nevada and Logan, Utah (Work, 1948).

In terms of applications the Soil Conservation Service had become the primary agency of USDA advising farmers on technical matters concerning the storage, movement, and use of water on the farm. SCS assumed responsibility for advising farmers on irrigation and drainage along with water supply forecasting. Working

through the field staffs and the conservation districts, there was great potential for using snow surveys in irrigation.

Arch Work believed that the snow surveying generally received strong support from the leadership of SCS, especially Chiefs Hugh Hammond Bennett and Don Williams, as well as the important staffs in administration, engineering, and public information (Work, 1989). The public information group especially appreciated the romance of "snow surveys" as a means of publicizing the agency. When most research functions of the Soil Conservation Service were transferred to the Agricultural Research Administration effective November 15, 1952, the water supply forecasting remained in SCS.

Snow Surveying Publication

The Division of Irrigation group realized that future expansion of the snow courses and water supply forecasting would be greatly enhanced by a snow survey manual. When the Division of Irrigation got involved in the work, the division's field people learned from experienced snow surveyors George D. Clyde and James E. Church (Helms, 1991). Also, literature on the subject was accumulating since the Western Interstate Snow-Survey Conference, begun in 1933, published articles on methods and procedures in its proceedings. But new snow surveyors and forecasters needed a manual, a compendium of the existing knowledge on snow surveys. James C. Marr, who had general supervision of the snow surveying work from his Boise, Idaho office, called upon the experts in the field for help in writing a manual on principles, purposes, and procedures of snow surveying. *Snow Surveying* (USDA Miscellaneous Publication No. 380) appeared in 1940. In addition to his own experiences Marr solicited information from the other snow survey supervisors (Parshall, Jessup, and Work) as well as George D. Clyde, J. E. Church, O. W. Munson, and Harold Conkling, the deputy state engineer of California. The manual described the care and use of equipment, snow sampling procedures, field office work, uses of water supply forecasts, maintenance of snow courses, stocking shelters, winter travel, and other topics (Marr, 1939; Marr, 1940). Prior to the use of aircraft, expansion of snow surveys depended in part on making cabins available. Snow surveyors needed cabins in order to make a trip of several days to remote snow courses. In the 1939 *Transactions, American Geophysical Union*, Arch Work and Ralph Parshall published a guide for the construction of snow survey cabins (Work and Parshall, 1939).

Snow Survey Network

The snow survey work expanded throughout the late 1930s. By the spring of 1940 approximately 753 snow surveyors made readings at 14,295 sampling points on 1,000 snow courses. The brunt of the snow surveying work fell on the rangers of the U. S. Forest Service and the National Park Service. Snow surveyors had available some 339 shelters. Only a portion of those had been built specifically for snow survey work. Others belonged to mining companies, power companies, and lumber interests. As the groups worked to add new cabins they tried to locate them about 16 miles apart, the average day's journey. Altogether the Division of Irrigation had about 50 cooperating federal, state, and local agencies and companies (McLaughlin, 1940; Work, 1989).

The network of snow courses developed rapidly. By 1943 there were 829 snow courses being surveyed. There had been about 1,000 courses, but the group eliminated some of these as unnecessary. There were 177 active cooperators. The surveyors had about 266 shelter cabins available to them, 77 of which were owned by the federal government. The network stocked 115 of these with food. In addition to the mimeographed releases there were some 153 radio broadcasts made during 1943 (McLaughlin, 1943).

Publicity

Winter sports enthusiasts recognized the value of the snow surveys for skiing and other activities. In the summer of 1937, the Division of Irrigation was asked to provide information on conditions for winter sports. The snow supervisors took to the airwaves

on the National Broadcasting Company. The offices at Berkeley, Medford, Boise, Fort Collins, and Logan collected information on 64 winter sports areas and had the information ready for a Friday broadcast at 9:00 pm. The National Broadcasting Company carried "Snowcasts" on the San Francisco station as well as two stations in Idaho, two in Washington, four or five in Utah, and one in Colorado (Work, 1989; Work, n.d.; McLaughlin, 1940).

Actually some of the broadcasts contained more than just the information on snow. For instance James Marr in Boise received information from the U. S. Forest Service and the Sun Valley Lodge. Listeners to Winter Sports Broadcast on December 31, 1937 over KIDO in Boise would have heard that a new ski lift and two new ski hills would open at the Payette Lakes winter sports area. At Sun Valley the University of Washington and Dartmouth College competed in a ski meet. Marr encouraged McLaughlin to include the Sun Valley forecast in the broadcast from San Francisco since the lodge drew many of its patrons from the West Coast, and in fact preferred them to local clientele. He wrote to McLaughlin, "In fact, the presence there of local people is looked upon as an obligation rather than an asset. That is, they are taken care of but their coming is not overly encouraged" (Marr correspondence).

The snow survey scored a major publicity triumph in 1942 with the appearance of "Engineers Survey Snow" in the April 1942 issue of *Life* magazine. Readers saw photographs of Arch Work and Jack Frost surveying near Oregon's Crater Lake. *National Geographic* featured snow surveys in their November 1949 issue. Arch Work assisted one of the magazine's writers, Leo Borah, in 1946 when he transported Borah to Crater Lake in a "Sno-Cat." Work suggested to Borah that a trip from the California-Oregon border along the crest of the Cascade range to the Columbia River would provide National Geographic with a splendid article. The Tucker Sno-Cat Company furnished the transportation and a mechanic-driver (the son of the owner) for the 23-day trip. The party of seven included Work, writer Andrew H. Brown, *National Geographic* photographer Jack Fletcher, SCS photographer Robert F. Branstead, Jasper Tucker, Harvey Woods, and Gaeton Sturdevant. The trip commenced in mid-March presumably after the heaviest snows. But snow fell all but two days during the trip. It snowed about ten feet along the journey. While publicity was an unannounced motivation, there was an operational objective. During the snow surveying season, surveyors ascended to various points near the crest of the Cascade range from the valley floor. The snow survey group had conjectured that one trip along the spine of the range in "Sno-Cats" might be a more efficient method of surveying. The trip convinced the group to stick with the earlier method (Work, n. d.; Brown, 1949).

Accuracy of Forecasts and Improvement of Methods

Some of the long-time users of snow surveys in the West were dedicated believers in their value. After the beginning of federal coordination in 1935, the snow survey supervisors added new cooperators and users rapidly. Credibility with these new users rested on the reliability of forecasts. The group chose to use the percentage method developed by James E. Church, which assumed that normal snow cover produced normal runoff. Snow course measurements were correlated with streamflow data collected by the U. S. Geological Survey and used in succeeding years to predict streamflow from the snow course measurements. The method assumed that the most important factor was precipitation and that losses could be grouped together and given a fixed value depending upon the particular watershed. The accumulation of several years or decades of records would supply values pertinent to the watershed. (Clyde, 1939). Snow surveyors believed they needed at least 10 years of data for reasonably reliable forecasts (Work, 1989).

However, where there was no historical record, and there was none for many of the courses, the methods sometimes did not work well in the seasons of subnormal or above-normal snowfall. In these cases when

the forecast was off it could be off 30 to 60 percent; in a few cases it was off by 100 percent (McLaughlin, 1943). Also the reliability of forecasts varied from one region to another, as the forecasters quickly realized when they moved into the southwest. The variability of spring and summer rainfall meant that forecasts for New Mexico generally had a 55.7 error rate (Beaumont, 1957).

Early snow survey supervisors realized there were many factors which could influence total runoff as well as distribution, but were not taken into account in the percentage method. The proceedings of the Western Interstate Snow-Survey Conference, later the Western Snow Conference, included numerous articles on attempts to accommodate these various factors in forecasting.

First of all, not everyone agreed that snow surveys were the best indicators of streamflow. The Weather Bureau maintained that precipitation, even if it came from the valleys rather than the mountain, was just as good an indication. In commenting on a paper by George D. Clyde and Arch Work at a Western Interstate Snow Conference in 1943, Merrill Bernard of the Weather Bureau's Washington office made the case for relying on precipitation:

> It is not in accord with known facts to discredit the "Valley Station" as a significant index to precipitation at higher levels. Precipitation-event (storm periods) have within themselves a unity which expresses itself in a high degree of dependency of precipitation measured at points of different elevation (including those below and within significant distance of the average snow-line), even though the character of the precipitation (rain or snow) is different at the points compared (Clyde and Work, 1943, Discussion by Bernard).

While the snow survey supervisors disagreed with this attitude, they did come to acknowledge the value of snow courses below the permanent snow pack.

Low flows, peak flows, and distribution of flows concerned users for a variety of reasons and involved many interrelated and complicated factors. On rivers without large storage reservoirs, the concern of irrigation farmers was not merely the total supply but the daily distribution of flow. Using historical records for the Logan, Ogden, Weber, and Provo Rivers in Utah, George D. Clyde developed a daily hydrograph and was then able to relate it to forecast curves (Clyde, 1939). One result of this concern was that the groups began forecasting for the date of the low flow in addition to the streamflow forecasts for April through September (Work, 1989).

Operators of multiple-purpose reservoirs particularly needed information about total flow and peak flow so as to make the maximum use of reservoirs for flood control, irrigation water storage, and hydroelectric power production. Fred Paget of California's Division of Water Resources believed temperatures at low elevation stations could be indexed to mountain temperatures and be used to assist in operation of reservoirs for flood control on the Kings River (Paget, 1943). Quite a number of the Soil Conservation Service group, such as Arch Work and Moreley Nelson, and others in university and state agencies published various articles pointing out the influence of soil moisture, groundwater levels, rainfall and temperature on streamflow. Work summarized many of the considerations in his *Stream-Flow Forecasting From Snow Surveys* (Work, 1953). Collectively the early group of snow surveyors knew many of the factors that influenced runoff. Essentially, they knew the right questions to ask. Relying on monthly snow surveys, however, did not give them timely information on soil moisture, temperature, and precipitation. The current SNOTEL system can provide not only the information on snow pack but also information on precipitation, temperature, soil moisture, and other factors on a timely basis to be used in forecasting.

More powerful computers allow forecaster today to assess the relative importance of various factors in streamflow.

Uses of Snow Surveys

Although water supply forecasters perceived a need to refine and improve forecasting methods, the percentage method was sufficient to make dramatic demonstrations of the value of snow surveys. The forecasters gradually accumulated examples of the value of snow surveys. George D. Clyde of the Utah Agricultural Experiment Station had made the most dramatic demonstration of the value of snow surveys. Clyde's April 1934 forecast predicted most watersheds in Utah would receive only 25 to 50 percent of their normal streamflows. The governor immediately made Clyde his special representative to contact all the water users to assist them in developing plans to use the limited amount of water that would be available (Clyde, 1934). Evidently Clyde performed admirably in getting farmers to adjust their planting schedules and acreage planted. This demonstration was one of the reasons Congress provided for federal coordination of snow surveys. In the late 1940s Clyde, a longtime professor of engineering at Utah State University, became the head of the Division of Irrigation and Water Conservation in the Soil Conservation Service. He moved the office from Berkeley to Logan, Utah.

The snow survey supervisors gradually added to these examples and used these in their publicity. Agencies doing construction and rehabilitation work on rivers needed streamflow information in order to determine the type measures needed to protect the construction. When the area below Elephant Butte Reservoir was going to be worked on in 1942, New Mexico wanted to know the total runoff from the Upper Rio Grande into the Elephant Butte Reservoir. The prediction was 1,941,000 acre-feet and the actual total was 1,938,000 acre-feet. Another forecast of the flow of the Columbia River allowed the Corps of Engineers to avoid unnecessary protection work for their construction near The Dalles (McLaughlin, 1943).

Even the most ardent believers in snow surveys could not predict all the uses. They received inquiries, especially in times of water shortage, from financial institutions, mercantile companies, eastern wholesale houses, power-companies, mines, municipalities, navigational interests, and agriculture (McLaughlin, 1943). In agriculture of course the main interest was in being able to adjust the timing as well as the amount of acreage planted. The sugar beet companies soon learned to await the water supply forecasts before signing contacts and adjusting the acreage contracts to the forecasts (McLaughlin, 1943.) In 1946 snow surveys in early spring indicated that the water supply for Deschutes and Cook counties, Oregon, greatly exceeded normal. Farmers were able to plant an additional 6,500 acres of land. The value of the produce was about $500,000 (Work, 1953). The information was particularly valuable in operating multiple-purpose reservoirs which stored irrigation water as well as producing some hydroelectric power. With good information the reservoir manager could maintain the maximum irrigation water and use the surplus to produce power for sale.

Flooding

Although the water supply forecasting group was not to be involved in flood forecasting, the value of the forecast for determining volume and as well as peak flows was recognized. In fact the early reports mentioned specifically the flood hazard. The value of snow surveys for assisting in flood prediction was made dramatically evident in the Columbia River flood of 1948. The May 1, 1948, forecast by James C. Marr from Boise, Idaho read:

> Retarded snow melt and above normal precipitation during April will increase the amount and rate of runoff throughout the northern and western parts of Columbia River Basin. The outlook a month ago in these areas for greater than normal runoff with possible flood hazard has changed to certainty of runoff of flood

> proportions with attendant damage in vulnerable areas.... Also extra high water may be expected on all of these streams during the latter part of May and June. This same situation may also extend to lower Columbia River.

The 1948 Columbia flood resulted in more than 50 deaths and property damage of 100 million dollars. (Clyde and Houston, 1951).

The weather in 1948 provided the exact combination for flooding. The snow cover was above normal in water equivalent. There was cold weather during the early part of the melting period, and above normal temperatures in the latter part of the melting period followed by above normal precipitation during the melting period. The Columbia River flood of 1948 had all of the above conditions. Arch Work used this and other conditions in writing *Stream-Flow Forecasting From Snow Surveys* (Work, 1953).

The snow courses provided information from the higher elevations, above the line where melting usually occurred in the winter, while most of the Weather Bureau's precipitation data stations were located in the lower elevations. Regardless of the agreement on flood forecasting, the important fact was that the operators of reservoirs, namely the Corps of Engineers and the Bureau of Reclamation, used the information in storing and releasing water. According to the Corps of Engineers and the Bureau of Reclamation, warnings in 1950 allowed the operation of reservoirs so that $5,600,000 in flood damages could be avoided (Clyde and Houston, 1951). The 1950 estimates had been for heavy snow pack. During 1956 the Corps of Engineers believed they had saved $37 million in flood damages by taking protective measures due to the water supply forecast (Beaumont, 1967). SCS believed that water supply forecasts had been used to avert $70 million in flood damages along the Columbia during the period 1956-1962 by use of reservoir control (Work and Shannon, 1964).

Another case of using snow surveys to lessen flood damages occurred in 1954 on the Kootenai River in Idaho. The April 9 forecast mentioned a potential flood and the May 10 survey predicted a 35.5 foot river crest. The town was evacuated and the dikes reinforced with the assistance of federal troops. The river crested at 35.55 feet. (Work, 1955).

The Bonneville Power Administration, in the early 1970s, estimated an annual value of $385,000 for extra power generated in three reservoirs studied. The U. S. Bureau of Reclamation in 1968 estimated they had avoided $495,000 in flood damages from Bull Lake, Pilot Butte, and Boysen Reservoirs in Wyoming. Similarly the Salt River Project believed it had prevented $600,000 in flood damages in 1960. The snow survey was used to operate the reservoirs in the Columbia River Basin. The average annual savings between 1956-1962 was $9.8 million (Soil Conservation Service, 1973).

Maturation of Program

By the late 1940s the program had reached a high degree of maturation. In 1948 the Division of Irrigation and the cooperating agencies made forecasts at approximately 176 gaging stations. About 1,000 snow surveyors made 2,400 different surveys at 950 courses. There was equipment to be repaired, cabins to be built, maintained and stocked with food. As soon as surveys were made the information had to be tabulated, forecasts made, and meetings held with forecast committees and local groups of water users.

Snow survey supervisors made forecasts for the Columbia River Basin (5), Rio Grande River basin (4), Oregon (4), Utah (1), Nevada (2), California (4) by the California Division of Water Resources, Colorado River Basin (4), Missouri & Arkansas River Basin (4), Montana (3), Arizona (3), and British Columbia (4) by the British Columbia Government.

Snow survey supervisors sent out 5,000 mimeographed copies of forecasts. Just as one example of publicity within a state, 56

Oregon newspapers and 13 radio stations publicized the results. At least three magazines published reports covering the entire West, *Reclamation Era, Western Construction News,* and *Electrical West* (Work, 1948).

At the end of the first two decades the snow survey supervisors were generally pleased with the operations. They wanted to expand the system of forecast committees but believed that additional information and snow survey personnel would be needed. One goal of the group in Arch Work's words was to "provide dependable streamflow forecasts for the benefit of farm operators on the smallest tributaries and on downstream industrial developments on major streams" (Work, 1948). The accumulation of data for over ten years made some of this possible, but the group was beset by the time-consuming calculations necessary to deal with the mass of data.

The snow survey supervisors continued to test and promote different modes of mechanizing the snow surveys. They tested over-snow machines produced by private as well as government agencies. They made more use of airplanes to reach high altitude snow markers. In time the water supply forecast group helped develop some of the technology to gather information more rapidly and easily.

Current technology, rather than diminishing our appreciation of snow survey achievements in the decades from 1930 to 1950 helps enhance it. Working with a meager budget, but much cooperation, the snow survey group along with California's Division of Water Resources proved the feasibility of regionwide snow surveys and set the stage for public support of mechanization of the operations.

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Conserving the Plains: The Soil Conservation Service in the Great Plains

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Hugh Hammond Bennett, in early April of 1935, found himself on the verge of achieving an ambition that had dominated his professional life for years, the establishment of a permanent agency dedicated to soil conservation. True, his temporary Soil Erosion Service in the Department of the Interior had received some of the money Congress appropriated to put people back to work during the Depression providing him an opportunity to put some of his ideas about soil conservation to work in demonstration projects across the country. But this had never been the ultimate objective; he had from the beginning yearned for something that would survive the Depression and attack soil erosion until it was eliminated as a national problem.[1] Friends of the soil conservation movement had introduced bills into Congress to create a specific agency for that purpose. Now, as Bennett sat before the Senate Public Lands Committee, he needed to make a convincing case. The sky darkened as dust from the plains arrived. The dust cloud's arrival was propitious, but not totally unexpected--at least not to the main witness. The Senators suspended the hearing for a moment and moved to the windows of the Senate Office Building. Better than words or statistics or photographs, the waning daylight demonstrated Bennett's assertion that soil conservation was a public responsibility worthy of support and continuing commitment to solve one of rural America's persistent problems. Bennett recalled that, "Everything went nicely thereafter."[2]

In the beginning, as so often would be the case in the future, the Great Plains seemed to be at the center of developments in soil conservation policies. Probably the soil conservation bill would have passed in any event. Bennett's crusading zeal converged with the opportunity offered by the Depression to get the work started, but the situation in the Great Plains provided the final impetus for legislation. The Depression awoke the nation to the interrelated problems of poverty and poor land use. The public glimpsed some of this suffering in the South in the photographs of the Farm Security Administration and those in Walker Evans and James Agees, *Let Us Now Praise Famous Men*, that told a tale of poor land, poor people, complicated by tenancy and racism. But it was the Great Plains that captured the national attention. Newspaper accounts of dust storms, the government-sponsored documentary classic, *The Plow That Broke the Plains*, and John Steinbeck's novel, *Grapes of Wrath*, evoked powerful images. For Americans, the Dust Bowl set the image of the human condition complicated by the problem of soil erosion. It remains a powerful historical touchstone for the public's ideas about soil erosion. We may collect data, analyze, and argue, as we do about the relative seriousness of soil erosion in our most productive agricultural regions like the Corn Belt or the wheat region in the Palouse. Occasionally stories appear in newspapers on salinity on irrigated land. But none of these situations compares with the inevitable question that accompanies each prolonged drought in the Great Plains: Is the "Dust Bowl" returning?

The Dust Bowl also proved to be the most popular area in the United States for historians studying soil erosion. Within the past decade historians have produced three books on the Dust Bowl--that section of the plains encompassing western Kansas, southeastern Colorado, northeastern New Mexico, and the panhandles of Oklahoma and Texas. If the wheat and grass sometimes wither in the plains, historical interpretation seems to flourish where the fates of man and land are so intertwined and subjected to the vagaries of climate. To

summarize the themes briefly, Donald Worster in *Dust Bowl: The Southern Plains in the 1930s* found the Dust Bowl to be the result of a social system and an economic order, capitalism, that disrupts the environment and will continue to do so until the system is changed.[3] For Paul Bonnifield in *The Dust Bowl: Men, Dirt, and Depression*, plains farmers struggled successfully not only against drought and depression, but also against too much government idealism, whose most threatening manifestation was the soil conservation district with its potential to make plainsmen "tenant farmers for an obscure and distant absentee landlord."[4] R. Douglas Hurt in *The Dust Bowl: An Agricultural and Social History* believed that farmers in general learned from the Dust Bowl and adjusted their farming practices, so that when drought returned in the 1950s so did wind erosion, but not the black blizzards."[5] These volumes detailed many of the specific farming practices that the Soil Conservation Service advocated in the Great Plains. In this article, I will concentrate on some of the later developments since the Dust Bowl. Finally, on pain of being labeled a geographical determinist, I want to make a few points as to how the Great Plains influenced national soil conservation programs and policies.

The establishment of the Soil Conservation Service created a locus for pulling together all the information on the best methods of farming, but farming safely within the capabilities of the land. The Soil Conservation Service at first worked through demonstration projects and the Civilian Conservation Corps camps. President Franklin Roosevelt in 1937 encouraged the states to pass a standard soil conservation districts act. Afterward, the U.S. Department of Agriculture could sign a cooperative agreement with the district. Much of the SCS's contribution to the districts has been providing personnel to the district. In this manner an agency concentrating on conservation established a presence in the countryside working directly with farmers and ranchers in a relationship that had two fortunate results. First, it made all the disciplines work together on common problems. Thus on the demonstration projects, it drew together the engineers, agronomists, and range management specialists. They were to work together on common problems rather than concentrating solely on their own discipline. Second, the Soil Conservation Service provided a means to work on what we now call technology transfer from both ends of the spectrum. This seemed particularly appropriate in the plains where farmers had struggled with wind erosion and devised a number of methods to combat it. State agricultural experiment stations and later USDA stations specializing in soil erosion provided answers. When SCS began operations, there were already some ideas on answers. To provide vegetative cover SCS advocated water conservation through detention, diversion and water spreading structures and by contour cultivation of fields and contour furrows on rangeland. The vegetative strips in stripcropping and borders of grass, crops, shrubs, or trees served as wind barriers. The young soil conservationists also encouraged the adaptation of crops and cultural practices to fit the varying topographic, soil, moisture, and seasonal conditions. Organic residues should be used to increase organic content and they should also be kept on the surface, as in the case of stubble-mulching, to prevent wind erosion. Critically erodible land should be returned to permanent vegetative cover. Rangelands could be improved by good range management through distribution, rotation, and deferment of grazing. Probably the most far-reaching recommendation was that farmers shift from extensive cash crop farming, wheat in particular, to a balanced livestock and farming operation, or that they shift to a livestock operation and the growing of livestock feeds only.[6] While technology has changed through the years, these essential elements still guide the soil conservation program.

In retrospect, progress in using rangeland more within its capabilities seems one of the more obvious achievements since the 1930s. By most measures, the condition of rangeland in the Great Plains and elsewhere has improved since the 1930s. Henry Wallace's preface to the Western Range

report in 1936 predicted it would take fifty years to restore the range to a condition that would support 17.3 million livestock units. That goal was reached in the mid-1970s. Other assessments by the Soil Conservation Service over the last twenty years reveal improvements in rangeland conditions.[7]

It would be difficult to attribute responsibility for this to particular agencies, be they federal or state. Even today, SCS works with approximately half of the ranchers in the Great Plains, though many of those not participating are part-time farmer-ranchers, with other sources of income. What is clear is a growing appreciation for the principles of range management in livestock raising. That is a definite shift from the attitude of the early-twentieth century when the concept that rangeland could be grazed too intensively was anathema to many cattlemen. The controversy about grazing intensity was such that Secretary of Agriculture James Wilson in 1901 wrote on the manuscript of a USDA bulletin on the subject: "all too true, but not best for us to take a position now."[8] Shortly after the dust storms in 1935, SCS Associate Chief Walter C. Lowdermilk was addressing a group of plains cattlemen only to have them terminate the meeting when he mentioned the baleful term "overgrazing."[9]

It has been quite a journey from that attitude to general acceptance of range management as being in the interest of the land and the rancher. Several elements seemed crucial to the development. SCS people working with local soil conservation districts and ranchers had to convince them that range management was in their best interests. The field people work for the most part with owner-operators and consequently in a less adversarial climate than the Forest Service and Department of the Interior range specialists, who had to try to improve range conditions by imposition of stocking rates and grazing fees on federal lands. Also, knowing that an educational job lay ahead, the range specialists had to develop a system to promote range management that was understandable to the SCS field technicians and ranchers alike. That necessity took what had generally been regarded as a research activity into the farm and ranch setting. The key for ranchers in wisely using rangeland was to know the condition of the range, so as to know when and how much it might be grazed without further deterioration. Thus, SCS needed to develop a system of range condition classification, based on scientific principles, that field staff of SCS and ranchers could understand and use.

Early range management pioneers recognized that the composition of the range changed with heavy grazing as cattle selected the taller, more palatable grasses, leaving the shorter, less palatable ones.[10] Following thirteen years of research on National Forest rangelands in the West, Arthur W. Sampson elaborated on this concept and observed that the surest way to detect overgrazing was by observing succession, or the "replacement of one type of plant by another." Furthermore, the grazing value of rangelands was highest where "the cover represents a stage in close proximity to the herbaceous climax and lowest in the type most remote from the climax."[11] Sampson's research prefaced the application of Frederic Clement's ideas about plant communities to practical range problems. A pioneer in prairie ecology, Clement theorized that grasslands were a community of plants in various stages of plant succession progressing toward a climax stage.

Range management experts in the Soil Conservation Service needed a classification system that could be used in the field in working with ranchers. Most range management systems in the 1930s and 1940s recognized the validity of ecological concepts for range management. The distinctiveness of the SCS system was that it would be a quantitative system that applied ecological concepts to range classification and management. Other systems were judged to be too qualitative for practical application in the field. The idea was to develop floristic guides of plant population for the various range condition classes. For instance, as rangeland is grazed by animals certain plants will show an increase in the

percentage of cover under heavy grazing; others will decrease, and in other cases heavy grazing leads to an invasion of plants onto the site. Thus, SCS field staff learned to inventory rangeland for particular "decreasers, increasers, and invaders" in determining whether the range condition fell into one of four categories--poor, fair, good, or excellent.

So as not to make too general a recommendation that would be of limited value, SCS added the concept of "range site" to the study of range management and improved range management practices. Foresters had originally developed the concept of site as an ecological or management entity based on plant communities.[12] Soil type, landscape position, and climate factors would be involved in determining the climax vegetation and should be taken into account when making recommendations for using rangeland following general instructions the local SCS soil conservationists had to delineate range sites in their soil conservation district. Field staff could then work with ranchers to develop a conservation plan that included advice on how best to use the land for grazing and at the same time maintain or improve range condition. In working with farmers SCS tried to ensure that ranchers understood the key plants and their response to light or heavy grazing and deferment. Overall the system was not supposed to focus solely on those plants that benefited cattle most. In concept it adhered to the suggestion of Clement that "There can be no doubt that the community is a more reliable indicator than any single species of it."[13] Advice to farmers might also include information on fencing, development of water supplies, and rotation grazing as range management theories changed over the years. But the reliance on range site and condition as the foundation has persisted to the present.

The range management experience illustrated two important points about the desirability of an interdisciplinary approach to problems and the need to link scientific theory to practical application. Because of its large field staff, SCS was able to test its ideas about using ecological quantification for range classification at numerous sites in the Great Plains. Isolated researchers have no such means for testing theory and classification in practice. The other point involves the emphasis on soil in range classification. Certainly the early ecologists emphasized soil as a part of the biotic environment. Nonetheless, it is quite likely that having both soil scientists and range managers in the same agency led to greater recognition of the importance of soil in site identification than might have been the case otherwise. Range management was but one of the cases in which the so-called action agencies such as SCS had to translate the scientific into the practical. In so doing it removed the prejudice often held toward what was considered strictly research or theoretical musings. The ecological emphasis and the recognition of the other values of rangeland for wildlife and water, not just the forage produced, seem to have increased the popularity of range management with ranchers.

Cultural practices, especially tillage methods, that reduced wind erosion found favor with farmers. Subsurface tillage, or stubble-mulch farming, eliminated weeds that depleted moisture during the summer fallow period while at the same time leaving wheat stubble on the surface to control wind erosion. Farmers employed the rotary rod weeder, or the large V-shaped Noble blade, or smaller sweeps in this work. Developments in planting and tillage equipment and in herbicides have added a whole array of planting and cultural methods that leave crop residues on the surface as well as increasing the organic content of the topsoil. These practices, such as no-till, ridge-till, strip-till, mulch-till, and reduced tillage fall under the general rubric "conservation tillage." The Conservation Technology Information Center, which promotes conservation tillage, estimated in 1988 that 23 percent of the acreage in the southern plains and 32 percent of acreage in the northern plains was planted with conservation tillage.[14] Larger farm equipment can have some adverse effects on conservation, but the powerful tractors make for timely emergency tillage

operations to bring moist soil to the surface to control wind erosion.

SCS's work in the Great Plains always emphasized retiring the most erodible soils to grass. Thus they worked on introducing grass and devising planting methods for the range. The land utilization projects provided a means to test some of these methods. But some plains farmers and absentee owners have continued to use erodible soils for cropland that would be better suited to rangeland or pasture. Nonetheless, as farmers have learned about their land through the hazards of erosion or poor crop production potential, or perhaps through the teachings of the Soil Conservation Service, there have been some adjustments from the homesteading days or the World War I era of wheat expansion. The system of land capability classification developed by the Soil Conservation Service in the late 1930s and recent surveys of land use provided some clues to this shift. In making recommendations to farmers, SCS learned to classify land. In class I are soils with few limitations that restrict use, class II soils require moderate conservation practices, class III soils require special conservation practices, and class IV soils have very severe limitations that require very careful management. Soils in class V and VI are not suited to common cultivated crops. The system takes into account several limitations on use. Where the major limitation is susceptibility to erosion, the subclass designation "e" is used. Generally less than 20 percent of the land in the worst classes, VIIIe and VIe is currently used for cropland, and less than half of the IVe land is used for cropland.[15] So there have been some adjustments.

Wind erosion is still a problem on the plains. While dust storms are not common generally, several years of drought, such as occurred recently can still set the stage for dust storms such as the one that occurred in Kansas on March 14, 1989.[16] The 1988-1989 wind erosion season was the worst since 1954-1955 when SCS started keeping records.[17] Nonetheless, one can perceive the cumulative effects of conservation practices that break up the flat, pulverized landscape and thus prevent dust storms from gathering force uninterrupted. Chief among them seem to be leaving crop residues on the surface, higher organic content of the soil, wind stripcropping, field windbreaks, and interspersed grasslands. The Conservation Reserve Program, authorized in the 1985 farm bill, that pays farmers to keep highly erodible land in grass has proven most popular in the Great Plains. This is not surprising, because the plains influenced it as they did so many other conservation programs.[18]

The drought that struck the Great Plains in the 1950s led once again to emergency drought measures, but also eventually to new soil conservation programs and policies. The Colorado legislature made $1,000,000 available to plains farmers in March 1954. The U. S. Department of Agriculture spent $13.3 million on emergency tillage in 1954, and another $9,275,000 in 1955. The Agricultural Conservation Program spent $70,011,000 on drought emergency conservation measures in twenty-one states during 1954-1956. Colorado, Kansas, Oklahoma, New Mexico, and Texas used $37,848,000 of the funds. Additional funds went to other drought relief measures.[19]

As it turned out, the 1950s drought provided an opportunity for SCS to promote a new program for dealing with conservation and drought in the Great Plains. They suggested to USDA's drought committee that any financial assistance be used to assist farmers to convert cropland back to grassland by paying 50 percent of the cost with the proviso that it remain in grass at least five years.[20] The full committee's report seized on the idea of long-term contracts for restoring grass. It went even further in saying that to discourage a subsequent plow-up it might be necessary to use "restrictive covenants and surrender of eligibility for allotments, loans and crop insurance."[21] Meanwhile, USDA representatives met with members of the rejuvenated Great Plains Agriculture Council to work on a program. It called for measures it was hoped would prove more lasting than the cyclical assistance in emergency tillage

and emergency feed and seed programs. The report called for "installing and establishing those practices which are most enduring and most needed but which are not now part of their normal farm and ranch operations."[22] President Eisenhower introduced the bill that was to become the Great Plains Conservation Program into Congress on June 19, 1956. Under the bill, the Secretary of Agriculture could enter into contracts, not to exceed ten years, with producers. No contract could be signed after December 31, 1971. The Secretary was to designate the counties in the ten Great Plains states that had serious wind erosion problems. The contracts were to stipulate the "schedule of proposed changes in cropping systems and land use and of conservation measures." The House Committee reported favorably on the bill with a few reservations. Only one major farm group showed up to testify in favor of the bill. John A. Baker of the National Farmers Union favored the bill, but even he reported that plains' farmers and ranchers had "some qualms and some apprehensions about these master plans."[23]

After the President signed the bill on August 7, 1956, (Public Law 84-102) Assistant Secretary Ervin L. Peterson designated the Soil Conservation Service to implement the program.[24] Cyril Luker, a native Texan who had worked in Amarillo in charge of erosion control practices, chaired an inter-agency group that would write the basic guidelines and program structure. Jefferson C. Dykes, Assistant Administrator and a student of the history of the Great Plains, chaired the work group on farm and ranch planning. Donald Williams, Administrator of the Soil Conservation Ser-vice, ordered the state conservationist of the ten Great Plains states to make proposals to the inter-agency group.[25] The government officials also held meetings with cattle- and sheep-raising groups as well as farm groups.[26]

In working with the inter-agency committee, SCS wrapped nearly two decades of experience into the program guidelines. Essentially, they wanted the individual contracts with farmers to bring about soil conservation while at the same time assisting in the development of economically stable farm and ranch units. Though he did not work on the Great Plains program, H. H. Finnell, former head of SCS's regional office at Amarillo, wrote in *Soil Conservation*, the official magazine of the Soil Conservation Service:

> A more logical and permanent remedy would be the development of an intermediate type of agriculture to use marginal land. This land is just as capable of being efficiently operated as any other lands, provided the demands made upon it are kept within its natural moisture and fertility capabilities. Ranching is not intensive enough to resist economic pressures; while grain farming is too intensive for the physical limitations of the land. A special type of agriculture for marginal land is needed. It must use the land more intensively than ranching and at the same time more safely than grain farming. Men of stable character and more patience than those who ride on waves of speculation will be needed to work this out.[27]

The contracts with farmers certainly did not dictate what was to be done; there would be mutual agreement. But it would nonetheless be a contract, and the contract would promote the idea of soil conservation and stability. The idea of risk reduction through diversification was certainly not new in the plains, or to other agricultural areas of the United States. Diversification helped farmer-ranchers withstand fluctuations in weather and prices. Surveys during the 1930s showed that failure in the plains came primarily among two groups, strict dry farmers who had no cattle, and cattlemen who grew no feed. Those who combined ranching and farming most often

succeeded.[28] SCS people such as Luker and Dykes recognized that stability was good for soil conservation. The Great Plains Conservation Program was to aim for both. The debate in the work group about farm and ranch planning over sharing the cost of irrigation illustrated the emphasis on the stability of operating units. Many members of the work group believed irrigation should be ineligible for cost-sharing, since it could not be considered a soil conserving practice. Dykes, however, argued that irrigation would be needed on some of the small ranches to achieve the goal of economic stability by providing supplemental feed.[29]

Irrigation was of course only one of the farming and ranching practices that contracts with the Great Plains Conservation Program would include. USDA would share the cost of some of these practices with the farmer. Assistant Secretary Patterson also decided that SCS should be responsible for making the cost-sharing payments for soil conservation practices to farmers and ranchers. It was a decision to which SCS attached the utmost importance. USDA began paying part of the cost of soil conservation practices under the Agricultural Conservation Program which was provided for in the Soil Conservation and Domestic Allotment Act of 1936. USDA seized on the soil conservation rationale to reenact production controls after the Supreme Court invalidated portions of the Agricultural Adjustment Act of 1933. Farming practices that were eligible for conservation payments became a point of contention between SCS and the agencies responsible for administering the Agricultural Conservation Program. Currently it is the Agricultural Stabilization and Conservation Service. SCS regarded some practices, such as liming, as annual production practices. SCS preferred sharing the cost of "enduring" soil conservation practices, such as terracing, that brought long-term benefits. Another long-held preference SCS people brought to their task was the matter of the whole farm conservation plan. Since the 1930s they taught that farmers should regard all their needs and concerns in planning for soil conservation while at the same time taking the need for cash crops, pasture, forage, and other needs into account. Of course, farmers could start using this plan at the rate they preferred. But the Great Plains program would involve a contract that provided for rather generous cost-sharing. Thus, it was required that the farmers and ranchers have a plan for the whole farm and that they install all the conservation measures, though the government might not be sharing the cost of all of them.

The three- to ten-year contracts called for a number of conservation practices--field and wind stripcropping, windbreaks, waterways, terraces, diversions, erosion control dams and grade stabilization structures, waterspreading systems, reorganizing irrigation systems, wells and water storage facilities, fences to distribute grazing, and control of shrubs. But by far the greatest emphasis was on converting cropland on the erodible sandy and thin soils back to grassland and improving rangeland and pastures to further diversified farming-ranching in the plains.[30] A recent program appraisal revealed that 53 percent of the GPCP contracts had been with combination livestock-crop farms, 30 percent with principally livestock farms or ranches, and just over 10 percent with crop and cash grain farms. About 85 percent of the units were under the same management when the contracts expired.[31]

The Great Plains, and more especially the Great Plains Conservation Program, influenced national soil conservation policies and programs as the long-term contracts to maintain cost-shared conservation practices became the standard procedure in other conservation programs. Soil conservation district people and SCS looked on the concept of a special program designed for a special conservation problem area as a model that could be used in other sections. Congress never approved any of the proposed programs for other sections of the country. The Agriculture and Food Act of 1981 included a section on Special Areas Conservation Program based in part on the GPCP experience. USDA did not request funds for the special areas, but did target some problem areas for extra funds.

The Great Plains, its climate, geography, and history, influenced another national program, the small watershed program as it is generally called. The Watershed Protection and Flood Prevention Act of 1954 made USDA one of the federal participants in flood control work. SCS took the leadership in working in upstream tributary watersheds of less than 250,000 acres. The flood control side of the project provided federal funding for floodwater retarding structures, channel modifications, and other engineering works to reduce flooding along streams. Watershed protection involved soil conservation practices on farms and ranches in the watershed to reduce the sediment moving to the streams and reservoirs. For much of its history, SCS has generally added soil conservationists to these watershed project areas to assist farmers with the soil conservation practices. USDA has been involved in 1,387 projects covering more than 87 million acres.

The Flood Control Act of 1936 gave USDA authority to work on flood control in the upstream areas. Some SCS people certainly favored retarding structures as part of the program to be submitted to Congress for approval, but they were stymied at the department level. The Flood Control Act of 1944 authorized eleven projects for work by the Department of Agriculture. SCS did build a few retarding structures, but the USDA General Counsel ruled against building any additional ones. In the late 1940s and early 1950s SCS was having difficulty getting additional programs approved. There the matter rested until floods hit the Missouri River in the early 1950s. Kansas City, Topeka, and Omaha demanded completion of the Pick-Sloan plans for flood control on the tributaries of the Missouri. Farmers and residents who would lose their farms and homes stridently resisted. They offered soil conservation and small dams in the headwaters as an alternative. The most vocal were the residents of the Big Blue Valley, north of Manhattan, Kansas. They were joined by residents of Lincoln, Nebraska, who had formed a Salt-Wahoo group to promote a small watershed program. Elmer Peterson, a journalist from Oklahoma, promoted small dams as an alternative in *Big Dam Foolishness.*[32]

That this debate should emanate from Oklahoma, Kansas and Nebraska was in part related to the climate and geography of the plains where farmers could raise corn in the moist bottomland to supplement the hilly grasslands that were too dry to support crops. A small watershed program would provide flood protection to land already used for agriculture, while large dams would inundate the best agricultural land and leave the land suited to grazing or wheat. Because of soil type and moisture the flood plains of the Missouri River tributaries were prized by farmers. Consider the case of N. A. Brubaker, who had 283 acres of land on the Vermillion River in Kansas. The 83 acres of bottom land that supplied feed for his livestock were about to be lost to the Tuttle Creek Dam. His 200 acres of hill land was nontillable. He posed this dilemma to Senator Arthur Capper, "Now if my bottom land will be effected by the water from the Dam, and taken away from me, what use would I have for the 200-acre pasture, as I would not have any land to raise feed for the live stock, and as there would be so much pasture land left in the same way, there would not be much chance of leasing it."[33] A chemistry professor at nearby Kansas State College believed similarly, that the bottomland was the only productive cropland in the Blue River watershed. "The Flint Hills upland provides grazing for cattle but is useless for cropping. There farmers must raise corn on bottomland to finish their cattle. This combination of bottom land for corn and truck farming, and upland for grazing has made the Blue Valley a productive, prosperous region. Without bottom land the entire region will be impoverished and depopulated."[34] The Tuttle Creek Dam and others of the Pick-Sloan plan were built, but the small watershed forces persisted. They met with President Eisenhower and secured his blessing. The small watershed program, authorized in the Watershed Protection and Flood Prevention Act of 1954, spread to the rest of the country. In addition to flood control on agricultural land, it has been used for protection of rural communities,

small towns, recreation, water supply, irrigation, and drainage.

The Great Plains also influenced the conservation provisions in the recent Food Security Act of 1985. The plains have been central to questions of landowners' responsibilities to neighbors in not letting erosion impact on their farms. This, of course, can happen with water erosion, with one farmer in the upper part of the watershed influencing the runoff and sedimentation taking place on a farm in the lower part of the watershed. But the most dramatic examples are usually wind erosion from cropland affecting a neighbor's fields. Generally the cases cited have laid the blame on outside investors looking for a quick profit in wheat. Whether this is an accurate portrayal in all cases, the breaking of rangeland for cropland did in part speed passage of some drastic changes in soil conservation laws and policies. It was undoubtedly one of the factors influencing the conservation provisions of the Food Security Act of 1985.

Probably the opening wedge in events that would change the conservation programs took place with the rise in grain prices following the large Soviet grain deals in the early 1970s. Grain exports for 1973 were double those of 1972, and the price quadrupled from 1970 to 1974.[35] At the time Secretary of Agriculture Earl L. Butz released production controls, including the annual set-aside acres. He declared, "For the first time in many years the American farmer is free to produce as much as he can."[36] Farmers in many sections of the country responded, but the plains received the most publicity, mostly for the removal of wide windbreaks for center pivot irrigation system.[37] A Soil Conservation Service survey later found that new, narrower windbreak plantings between 1970 and 1975 offset the losses.[38]

As stories of increased soil erosion spread, groups that had played a large role in the environmental movement increasingly turned attention to soil erosion. They--along with allies in Congress--questioned the effectiveness of existing soil conservation programs. The Soil and Water Resources Conservation Act of 1977 mandated studies of the soil and water conservation programs and the development of new policies to attack the problem. The lobbying and studies resulted in some changes in policies, but the drastic changes came with the 1985 farm bill. Events in the plains played a key role in the new conservation authorities that would appear in the bill. Between 1977 and 1982 wheat farmers planted large tracts of grassland in Montana (1.8 million acres), South Dakota (750,000 acres), and Colorado (572,000 acres). In some places the resulting wind erosion proved a nuisance to neighbors. Some vocal and effective local landowners such as Edith Steiger Phillips of Keota, Colorado, wanted action. The Coloradans persuaded Senator Williams Armstrong in 1981 to introduce a bill that would deprive those who plowed fragile lands of price support payments. Such payments have long been seen as inducing speculation and reducing normal caution in planting very erodible land to wheat. Mainline groups like the Colorado Cattlemen's Association and the American Farm Bureau Federation supported the legislative effort. Several counties in Colorado, including Weld County where Edith Phillips lived, and Petroleum County in Montana passed ordinances to try to prevent plowing on grasslands.

The Armstrong bill, finally dubbed the "sodbuster bill" did not become law. USDA wanted to wait for the next reauthorization of the general farm bill to consider any new provisions, but the pressure from the Great Plains gave some grass roots support for changes in the conservation provisions. The Food Security Act linked soil conservation to eligibility for other USDA programs. The act included sodbuster as well as other conservation provisions. The framers of this act especially wanted to eliminate the possibility that commodity price support programs encouraged poor soil conservation practices. Under the conservation compliance section farmers have until 1990 to begin applying a conservation plan on highly erodible land, and until 1995 to fully implement the conservation plan in order to stay eligible for other USDA programs.

The sodbuster provision applies to any highly erodible field that was neither planted to an annual crop nor used as set-aside or diverted acres under a USDA commodity program for at least one year between December 31, 1980 and December 23, 1985. If farmers wish to bring such land into production, they would lose eligibility for USDA programs unless they applied an approved conservation system to control erosion on the fields. The swampbuster or wetland conservation stipulated that farmers would lose eligibility for USDA programs if they drained wetlands after December 23, 1985, the date of the passage of the act. A conservation coalition that lobbied for this provision included old-line soil conservation organizations like the Soil and Water Conservation Society of America and the National Association of Conservation Districts as well as environmental groups. Prominent officials in USDA such as John Block and Peter Myers favored many of the provisions. But the grass roots examples of support from the plains influenced Congress even more. This is a prime example but not the only one of the way commodity programs instigated the use of land for cropland that would be better suited to rangeland. Emotionally, the conversion of rangeland to cropland has an appeal that catches the public attention more than erosion from cropland in the humid east. The 1985 provisions are some of the most far-reaching we have seen in agriculture. They are premised on the idea that some USDA programs induced the use of erodible land that would not have occurred otherwise. The Great Plains, as they so often did, served as the prime example for changes in soil conservation policies.[39]

Endnotes

[1] Hugh H. Bennett, *The Hugh Bennett Lectures* (Raleigh, North Carolina: The Agricultural Foundation, Inc., North Carolina State College, 1959), 23.

[2] This episode is agency folklore around the Soil Conservation Service. I was skeptical of its veracity. In the records of the Soil Conservation Service in National Archives, I located some telegrams which indicated that Bennett was usually informed about the location of dust storms. Then I found that Bennett had told fellow North Carolinian and author Jonathan Daniels about the episode. Another variation of the story, which I have not confirmed, is that Bennett had the Senate hearing delayed until the dust storm's anticipated arrival. Jonathan Daniels, *Tar Heels: A Portrait of North Carolina* (New York: Dodd, Mead & Company, 1941), 188. Wayne Rasmussen also investigated this question and concluded from Senate hearings that the story was probably true. Wayne D. Rasmussen, "History of Soil Conservation, Institutions and Incentives," in Harold G. Halcrow, et al., eds., *Soil Conservation Policies, Institutions, and Incentives* (Ankeny, Iowa: Soil Conservation Society of America, 1982), 7.

[3] Donald Worster, *Dust Bowl: The Southern Plains in the 1930s* (New York, N.Y.: Oxford University Press, 1979), 5.

[4] Paul Bonnifield, *The Dust Bowl: Men, Dirt, and Depression* (Albuquerque: University of New Mexico Press, 1979), 130.

[5] R. Douglas Hurt, *The Dust Bowl: An Agricultural and Social History* (Chicago, Illinois: Nelson-Hall Publishers, 1981), 156.

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[7] Donald T. Pendleton, "Home, Home on the Range," *Journal of NAL Associates* 7 (1982): 78-93.

[8] Russell Lord, *To Hold This Soil*, USDA Miscellaneous Publication No. 321 (Washington, D.C.: U.S. Department of Agriculture, 1938), 67.

[9] Lord, *To Hold This Soil*, p. 67.

[10] Donald T. Pendleton, "Range Conditions and Secondary Succession as Used in the Soil Conservation Service," in press, 4.

[11] E. J. Dyksterhuis, "Condition and Management of Range Land Based on

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[12] Thomas N. Shiflet, "Range Sites and Soils in the United States," in *Arid Shrublands: Proceedings of the Their Workshop of the United States-Australian Rangelands Panel* (Tucson, Arizona, 1973), 26-33.

[13] Dyksterhuis, "Condition and Management of Range Land," 111.

[14] *National Survey, Conservation Tillage Practices, 1988* (West Lafayette, Indiana: National Association of Conservation Districts, 1988), 6.

[15] Data Base, National Resources Inventory, 1982. Soil Conservation Service, Washington, D.C.

[16] *Salina* (Kansas) *Journal*, March 15, 1989, 1.

[17] "Wind Erosion Worst in Over 30 Years,.' USDA News Release 789-89. June 19, 1989.

[18] For a view that questions the presumptions of the early soil conservationists working in the Great Plains see especially James Malin's "Men, the State of Nature, and Climate," and other essays in Robert P. Swierenga, James C. Malin, *History and Ecology: Studies of Grassland* (Lincoln: University of Nebraska Press, 1984), 1-374.

[19] R. Douglas Hurt, "Return of the Dust Bowl: The Filthy Fifties," *Journal of West* 28 (1979): 89-90; "Federal Cost-Sharing for Drought Emergency Conservation Measures, 1954-1956, Agricultural Conservation Program," Drought File, General Correspondence, Records of the Office of the Secretary of Agriculture, Record Group 16, National Archives and Records Administration, Washington, DC.

[20] Recommendations of the Soil Conservation Service to the Departmental Committee on Land Use Problems in the Great Plains, May 12, 1955, Historical SCS Reports File, Great Plains Conservation Program Files, Soil Conservation Service, Washington, D.C.

[21] Preliminary Report of the U.S. Department of Agriculture on Possible Solutions for Agricultural Problems of the Great Plains, May 1955, Historical SCS Reports, Great Plains Conservation Program Files, SCS, Washington, D.C.

[22] *Program for the Great Plains*, U.S. Congress, House Document No. 289, 84th Cong. 2d. sess., 1956, p. 4.

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[26] Minutes, Great Plains Inter-agency Group, December 17, 1956 and February 17, 1957, Great Plains Conservation Program Files, Soil Conservation Service, Washington, D.C.

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[32] Douglas Helms, "Small Watersheds and the USDA: Legacy of the Flood Control Act of 1936," in *The Flood Control Challenge: Past, Present, and Future* (Chicago, Illinois: Public Works Historical Society, 1988), 67-88; Homer E. Socolofsky, "The Great Flood of 1951 and The Tuttle Creek Controversy," in John D. Bright, ed., *Kansas: The First Century*, Vol. II. (New York, N.Y.: Lewis Publishing Company, Inc., 1956), 494-502.

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The Great Plains Conservation Program, 1956-1981: A Short Administrative and Legislative History

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Enthusiastic supporters of the Great Plains Conservation Program recently gathered to celebrate the 25th anniversary of the authorizing legislation, signed August 7, 1956. The program was the latest of the nearly three-quarters of a century of local, state, and federal efforts to deal with drought, dust storms, and the resulting agricultural instability on the Great Plains. The novel feature of the program was that it provided for the government's sharing the cost of conservation measures with farmers and ranchers under a contract.

Settlement and Early Droughts

The proponents of this new concept had reason to believe that something new was needed to adjust man's agricultural endeavors to the climatic and geographic realities of the plains. Most had witnessed the drought of the 1930s and had heard tales of the ones in 1887-97 and 1910-13. The emphasis in the new program on developing enduring conservation practices rested on an understanding that drought would return to the Great Plains. A review of earlier periods of climatic stress is important because the understanding of recurring drought shaped the thinking of the people who devised and administered the Great Plains Conservation Program.

Reports from 19th century military expeditions led Americans to regard the area between the 100th meridian and the Rocky Mountains as the "Great American Desert." Major Stephen H. Long, after crossing the area, declared it "almost wholly unfit for cultivation, and of course uninhabitable by a people depending upon agriculture for their subsistence." Soldiers returning from the Civil War had plenty of the fertile tall grass prairie left to settle.[1] Eventually settlement pushed westward to the plains as promoters tried to dislodge the notion that the region was not fit for agricultural settlement. The few who had pushed out onto the plains in the mid-1870s had to withstand both drought and grasshoppers.[2]

With the return of favorable weather in the 1870s, movement into western Kansas and Nebraska intensified. In Ellis County, Kansas, it was observed that "incessant breaking for wheat can be seen in all directions."[3] The boom in settlement peaked in the mid-1880s. There were 3,547 homestead entries in Kansas in 1884. New entries in 1885 and 1886 numbered 9,954 and 20,688, respectively. As the boom receded in Kansas it continued in Colorado. There had been only 1,808 homestead entries in 1886; the number increased to 5,081 in 1887 and peaked at 6,411 the following year. During the latter two years, 4,217,045 acres, predominantly in the plains, were filed under the Homestead Act and the Timber Culture Act. The lack of capital and insufficient knowledge about farming in semiarid conditions took its toll when the drought resumed in the late 1880s. That many settlers had departed and that many never took up residence on their claims was evident in the 1890 census. There were only 3,535 farms reported in fifteen eastern Colorado counties. Quite a number of these farms were along the Arkansas and Platte rivers.[4]

The western movement was turned back with the drought that began in the late 1880s and lasted ten years with a few good years interspersed. Population statistics revealed the impact but not the suffering involved. Western Nebraska had a decline of 15,284 residents during the decade of the 1890s. During the same period the western Kansas population dropped from 68,328 to

50,118, and a considerable number had left before the census was taken in 1890.[5] According to one estimate, half the population of western Kansas departed between 1888 and 1892. Twenty vacant towns stood witness to the effects of drought on the entire economy.[6]

Farther south in Texas, farming had not supplanted ranching to any great extent. Generally, the farms were larger than those of the other plains states which had been limited in size by the homestead laws. Having larger farms, Texans were better able to persevere through the drought.[7] Drought also struck the northern plains, and population declined in some areas. As would be the case in the future, drought was not as devastating as it had been in Nebraska, Kansas, and Colorado.[8] Emergency relief measures did not begin with federal assistance in the 1930s. Already in the 19th century state governments were being called upon for assistance. A Mendota, Kansas, housewife wrote to Governor Lewelling in 1894, "I take my pen in hand to let you know that we are starving to death. It is pretty hard to do without anything to eat here in this God forsaken country....My husband went away to find work and came home last night and told me that he would have to starve....If I was in Iowa I would be all right." With such conditions widespread, several state and private organizations undertook relief measures. The Nebraska legislature appropriated $200,250 in 1891, mainly for food and grain. Colorado provided $21,250 to supply farmers in eight counties with seed for the 1891 planting season.[9] Kansas spent $60,000 for the same purpose in 1891. In response to the 1886 drought in Texas, the state gave $100,000 in aid to 28,000 individuals.[10]

The drought dislodged the belief among farmers as well as the scientific community that rain followed the plow; that growing crops and plowed fields induced greater rainfall.[11] With that faith destroyed, farmers and agriculturalists were ready to make concessions to the climate and turned their attention to adjustments in farm management, cultivation methods, and drought resistant crops.

The hardy qualities of the "Turkey Red" wheat brought to the plains by Russian-German immigrants around 1873 became obvious during the dry years. Mark Carleton and others now set out to discover other crops suitable to the area.[12]

Farmers began to adapt their cultural practices to the climate. Hardy Webster Campbell became the chief promoter of dry farming, although some of the measures predated his involvement in the campaign. Campbell's *Soil Culture Manual* (1902) recommend deep fall plowing, thorough cultivation before and after seeding, light seeding, alternating summer fallow, tillage during fallow and crop years, sub-surface packing, and inter-row cultivation.[13]

With the return of favorable weather in the first decade of the 20th century, dry farming spread across the plains. Cattle raising was also prospering. Both ventures received a shock with the return of drought in 1910. The dry farming method had some sound elements, but it was no panacea for withstanding drought The dry farming movement was practically destroyed in South Dakota, leading one critic of its more exaggerated claims to surmise that it was time to "to cut out the cheap talk about dry farming and talk cows."[14] Actually the cows were not fairing all that well either. Selling during the drought, 1910-11, and losses during the winter of 1911-12 reduced Great Plains herds seventy percent. The reduction drove many ranchers out of the business. The turnover of ownership benefited the land. Newcomers had a better idea of the value of good range management, both to their pocketbooks and to the conservation of the range.[15]

The 1910-13 drought in the southern Great Plains brought another problem. A small "dust bowl" developed in Thomas County, Kansas. Although dust storms were not confined to Thomas County, the storms that swept over 65,000 acres from 1912-14 were probably as severe as any since. Responding to the need to reduce dust storms, Kansas State College issued its first bulletin on wind erosion control in 1912.[16]

The return of rain in 1914, high prices, and government exhortations to produce for the war effort led to an expansion of wheat growing in the Great Plains. The wheat acreage in the plains areas of Montana, North Dakota, and South Dakota increased from 2,563,000 acres in 1909 to 4,903,000 acres in 1919. Nationwide profits on wheat rose from $56,713,000 in 1913 to $642,837,000 in 1917. Between 1909 and 1924 plains farmers increased the wheat acreage by 17,000,000 acres. Even the drought in 1917-1921 did not measurably slow the change. Many settlers gave up in the northern plains but acreage figures for wheat held steady. Nor did the drop in wheat prices in the early 1920s have much effect. Farmers responded to declining prices by planting more to recoup dwindling profits. Another 15,000,000 acres went from grass to wheat between 1924 and 1929. Much of the expansion in the late 1920s took place in the southern plains where wheat acreage increased 200 percent between 1925 and 1931. With only a few interruptions the years 1914-1931 had been good in terms of weather.[17]

The Dust Bowl

The 1930s ushered in another prolonged drought. Scant use of structural, cultural, and vegetative water conservation measures further complicated the problem. The lack of rainfall prevented good stands of wheat and left the ground barren for wind erosion. By August 10, 1933 there had been thirty dust storms in the vicinity of Goodwell, Oklahoma. Another year of drought in 1934 left 97,000,000 acres in eastern Colorado, western Kansas, eastern New Mexico, and the panhandles of Texas and Oklahoma susceptible to wind erosion. Newspaper reports brought the storms national attention. A reporter for the *Washington* (D.C.) *Evening Star* supplied the term "dust bowl" to describe the area.[18] The dust bowl, or the worst of the general blow area, was in Baca County, Colorado; the six most southwestern counties in Kansas; Cimarron and Texas counties, Oklahoma; Dallam and Sherman counties, Texas; and a portion of Union County, New Mexico.[19]

The Soil Conservation Service and its predecessor, the Soil Erosion Service, had increasingly turned their attention to the area. By the end of 1936, SCS had established fifty-five demonstration projects in the Great Plains with a heavy concentration in the worst wind erosion areas. When the projects began in 1934, only 10,454 acres in the project areas were being farmed using soil and water conservation measures. With its large force of Work Projects Administration and Civilian Conservation Corps labor, plus the work of farmers, the Service made progress. The results at the conclusion of 1936 were impressive--conservation measures in place on 600,000 acres--including 155,000 stripcropped acres, 200,000 contour tilled acres, contour furrows on 85,000 acres of grasslands, and 3,600 miles of terraces on 65,000 acres. Additionally, 200,000 acres of grassland were under management to prevent overgrazing. The acreage of erosion retarding crops had been increased twenty-eight percent. With the adoption of conservation district laws by the states, beginning in 1937, the Service extended its technical assistance to areas outside the demonstration projects. The Service assisted in contour listing (an emergency wind erosion control practice) 2,500,000 acres in 1936.[20] The federal government spent $793,000 for emergency wind control measures under its Agriculture Conservation Program in 1938. The total drought emergency expenditures for cattle and sheep purchases, feed and forage, seed, loans, and erosion were $212,916,000 in 1936, $2,735,000 in 1936, $515,000 in 1937, and $1,000,000 in 1938.[21]

Other government programs involved planting windbreaks in the shelterbelt project supervised by the Forest Service. The Farm Security Administration and the Bureau of Agricultural Economics purchased what were termed "submarginal lands" under the land utilization program. After revegetating the land, the government proposed to lease it for grazing. SCS eventually assumed leadership of both programs.

The Plains in the 1940s

Again the rain and war seemed to arrive at about the same time. Weather in the Great Plains improved in 1940. The government called on farmers to produce food for the military forces and the allies when World War II began. As SCS employees entered the armed forces, the reduced staff was instructed that "Emphasis should be given to the widespread application of conservation practices that contribute the most to maintaining or increasing yields and that can be (1) applied with little or no additional use of farm labor, equipment, power and production supplies and (2) furthered with the minimum of technical assistance." Nationwide, World War II had varying effects on soil conservation. The situation in the Southeast and Mississippi Delta improved in 1943-44 when compared to 1935-39, due partially to the reduction of row crops. The Corn Belt had significant losses compared to 1935-39. The Great Plains showed little change after the recovery from the dust bowl but there was cause for concern about the future.[22]

H. H. Finnell, regional conservationist at SCS's Amarillo (Texas) office and an authority on wind erosion control, was concerned. He conceded that the World War II plow-up had not been as extensive as that of World War I. Nonetheless, he saw future problems. Farmers had planted pinto beans on loose, sandy soils in New Mexico, cotton on sandy land in Texas, and wheat on thin soils in Colorado. Finnell particularly directed his ire at absentee land speculators in Colorado, who had tried to get Colorado's soil conservation law nullified in the state supreme court and who were lobbying to have the lands reclaimed under the land utilization program put up for sale.

Not only was the use of submarginal land for crops detrimental to the soil, according to Finnell, but also it could not be justified economically. The profits from wheat for a few years would not compensate for revenue lost on grazing while the range was being re-established. Finnell called for a special type of agriculture for the area:

> A more logical and permanent remedy would be the development of an intermediate type of agriculture to use marginal land. This land is just as capable of being efficiently operated as any other lands, provided the demands made upon it are kept within its natural moisture and fertility capabilities. Ranching is not intensive enough to resist temporary economic pressures; while grain farming is too intensive for the physical limitations of the land. A special type of agriculture for marginal land is needed. It must use the land more intensively than ranching and at the same time more safely than grain farming. Men of stable character and more patience than those who ride on waves of speculation will be needed to work this out.[23]

The trend continued as prices held up after the war because of demand from countries where war had disrupted the agricultural economy. Between 1941 and 1950 farmers broke out about 5,000,000 acres. The estimate was that 3,000,000 acres of this land was not suitable for cultivation. In fact, some of it had not previously been in crops.[24]

Drought of the 1950s

An extended drought and dust storms returned in the 1950s. Western Nebraska ranchers travelling to their annual convention on June 8, 1950 had hazardous driving conditions and saw roadside ditches filled with soil. Most of the 100,000 windswept acres in Scottsbluff, Box Butte, Morrill, and Sioux counties were summer fallow fields with no conservation practices or irrigated sandy land for beets and beans.[25] The worst blowing of the 1950s was yet to come. SCS surveyed the plains and located the most susceptible areas. The survey cited the bean growing area of Colorado--Pueblo, Crowley, El Paso, and Lincoln counties. The wheat had died over large parts of the

Oklahoma panhandle. Chase and Perkins counties, Nebraska, were listed as critical, as was central Kansas. There were problems in the cotton growing areas of Lamesa-Lubbock, Texas. Eastward across the plains, the western cross timbers of Oklahoma and Texas planted in cotton, wheat, peanuts, and watermelons had also experienced blowing.[26]

The Department of Agriculture set up a Great Plains Committee in April 1950 to study the problem and make recommendations. The drought continued, leaving acre after acre without any vegetation to protect it from erosion. The dust storm that signalled the national awakening to the "filthy fifties" occurred on February 19, 1954. H. H. Finnell observed the storm from Goodwell, Oklahoma. He wrote to Tom Dale of SCS:

> ... conditions in the marginal zone are worse than in the 1930s because poorer lands under more arid conditions have been exposed to wind erosion in a wider territory than in the 1930s.....it will be more difficult to subdue than the wild lands of the 1930s. Catastrophe to the land has already exceeded that of the 1930s, but due to the absence of financial straits and hysteria which existed in the 1930s, farm abandonment has been much slower to gain headway....I had hoped the lessons of the 1930s would be more widely grasped and acted upon than they have been. I don't know how many times this thing will have to happen to the Southern High Plains before the idea of safe land use soaks in. The agricultural potential of the area was measurably lessened by the experience of the 1930s and will be again. Too much Class IV land is being physically transformed into Class VI and VII.[27]

Newspapers treated the nation to stories that depicted little difference between the drought of the 1950s and that of the 1930s, except for the absence of outmigration. The *Washington* (D.C.) *Daily News* proclaimed that the "new dust bowl" was "in roughly the same place on the map as the old one."[28] Actually there had been some significant changes. The area subject to wind erosion was larger and encompassed all of the area of the 1930s. More significantly the centers of the worst areas had shifted and expanded. The area in New Mexico stretched from Quay down to Lea County. Adjoining it in Texas, the blow area was bounded by Palmer County on the north and Ector County in the south. The Colorado blow area extended from the eastern border to El Paso and Pueblo counties. The points of the triangular area in Kansas were Wallace, Finney and Morton counties. With the exception of Baca County, Colorado, and Morton County, Kansas, most of the earlier dust bowl was not included. The conservation measures of the 1930s had obviously helped. After another three years of drought, some of the older dust bowl had been included, but the problems were not as persistent as those of the newer areas that Finnell had pointed to in his 1946 article.[29]

The Colorado legislature made $1,000,000 available to dust bowl farmers in March 1954. The U.S. Department of Agriculture spent $13.3 million on emergency tillage in 1954 and another $9,275,000 in 1955. The Agriculture Conservation Program funds spent on drought emergency conservation measures in twenty-one states, 1954-56, totaled $70,011,000. Colorado, Kansas, Oklahoma, New Mexico, and Texas used $37,848,000 of the funds. Additional funds went to other drought relief measures.[30]

USDA and the Great Plains Agricultural Council

While the relief measures were being extended to the plains states, the USDA continued working through its committee on land use problems in the Great Plains to

develop a program to reduce the need to respond periodically with emergency measures. The Soil Conservation Service suggested to the committee that the government use "financial assistance to encourage farmers to convert cropland to grass with the federal government paying at least 50 percent of the cost and making an agreement to continue the program over a 5-year or longer period."[31] The full committee elaborated on the proposal. The report recognized that "diverting the 6 to 8 million acres of cropland that are unsuited for cultivation to grassland is largely a problem of voluntary action or land use regulation, hence it must be handled mainly by State and local governments and individual owners." But "cost-sharing payments....might be increased and spread over a period of 3 to 5 years while grass is being established." To discourage a subsequent plow-up it might be necessary to use "restrictive covenants and surrender of eligibility for allotments, loans and crop insurance."[32]

Meanwhile, the Great Plains Agricultural Council, born during the drought of the 1930s, had begun to develop a long-range program. Representatives of the USDA met with council members on May 31-June 2, 1955, to develop a program. A later meeting, July 25-27, refined the proposals. President Dwight D. Eisenhower transmitted the council's "Program for the Great Plains" to Congress on January 11, 1956. The program did not specify that cost-sharing for conservation practices would be offered through contracts with farmers and ranchers. It did, however, call for sharing the cost of "installing and establishing those practices which are most enduring and most needed but which are not now a part of their normal farm and ranch operations. The ACP cost-sharing program on those practices that are intended to bring about those land use adjustments required for a long-range program will be accelerated and rates of payments made more flexible."[33]

The Department of Agriculture was already considering the specifics of how the program might be implemented, including long-term contracting. Donald A. Williams, Administrator of the Soil Conservation Service, wrote to Assistant Secretary of Agriculture Ervin L. Peterson that the soil conservation districts would be a perfect device for implementing whatever plan Congress adopted. Williams made it clear that the districts could incorporate these new activities into their existing programs so as "to insure a permanent, sound coordinated land use and management program in the Great Plains area." To emphasize SCS's interest in the new program Williams made it clear that he was "prepared to ask SCS personnel to aggressively work with the district governing bodies to the fullest extent possible in this effort."[34]

Public Law 84-1021

Congressman Clifford Hope of Kansas introduced a bill (H.R. 11833) on June 19, 1956, that was to become the Great Plains Conservation Program. The bill provided that the Secretary of Agriculture could enter into contracts, not to exceed ten years, with producers. No contract was to be signed after December 31, 1971. The Secretary was to designate the counties in the ten Great Plains states that had serious wind erosion problems. The contracts would outline the "schedule of proposed changes in cropping systems and land use and of conservation measures" to be carried out. The bill further stipulated the obligations of the grower and made the provision that any acreage diverted to grass would not affect commodity acreage allotments for the time of the contract. Not more than $25,000,000 was to be spent in any year, and the total could not exceed $150,000,000. Assistant Secretary Peterson testified before the House Committee on Agriculture on June 28, 1956. Peterson responded mainly to questions concerning how the program differed from the new Soil Bank. Representatives from beef producing states expressed concern over the effects of putting more land to grazing purposes when cattle prices were already depressed.

Karl C. King, a Pennsylvania congressman, but a native of Reno County, Kansas, thought that buying the land would be cheaper than applying conservation measures. Congressman Hope interceded to

explain what the program planned to accomplish in terms of farm management. One of the problems of the plains had been the pattern of outmigration during drought followed by a wave of new settlers when the weather improved. Each new group had to learn the tough lessons that came with the drought. The proposed program, as Hope explained it, would assist farmers and ranchers through the drought, improve farming and ranching techniques, and lessen the impact of future droughts.

The hearings concluded after John A. Baker of the National Farmers Union testified in favor of the legislation. Baker, who would later oversee the Great Plains Conservation Program as Assistant Secretary of Agriculture, had some reservations. He wanted it known explicitly that the new program would be a "partial supplement, not a substitute for existing programs." The possibility that the Farmers Home Administration could deny credit to farmers who did not follow a conservation plan was also of concern. Baker stated that plains farmers and ranchers had "some qualms and some apprehensions about these master plans." Nonetheless, the Union supported the bill.[35]

In reporting out the bill on July 7, the committee emphasized that the program was voluntary and that participation would not be a necessary condition for making acreage allotments, FHA loans, agricultural credit, or eligibility for other Department of Agriculture programs. One proposal to speed up the conversion of land not suited for cropping back to rangeland had been to make crops on that land ineligible for federal crop insurance. Although the committee did not specifically mention the insurance program, the report gave their view on possible linkage of USDA programs.[36]

The House of Representatives passed the bill on July 23, and the Senate concurred without changing the bill on July 26. President Eisenhower signed Public Law 84-1021 on August 7, 1956, with the statement that the act authorized the "Secretary of Agriculture to enter into long-term contracts with farmers and ranchers in the Great Plains states to assist them in making orderly changes in their cropping systems and land uses which will conserve soil and water resources and preserve and enhance the agricultural stability of that area."[37]

SCS Selected to Administer Program

It then fell to the Department of Agriculture to develop a plan for administering the program. Actually, the agencies within the Department were at work on plans before the President signed the legislation. Donald Williams of SCS and Paul Koger of the Agricultural Conservation Program Service had discussed implementation. They agreed on a number of points but could not agree on which agency should administer the program. Both wrote to Assistant Secretary Peterson in early August. Williams presented a detailed proposal for administering the program with SCS as the lead agency. Koger pointed out that ACPS had traditionally dealt with the cost-sharing aspects of conservation programs. Both agencies continued to work on plans and awaited the decision. The Commodity Stabilization Service supported the ACPS. The Great Plains Agricultural Council suggested that the county Agricultural Stabilization and Conservation committees handle the cost-sharing aspects of the services.[38]

Peterson resolved the issue in Secretary's Memorandum No. 1408 on December 10, when he assigned responsibility to SCS. He also announced the creation of the Great Plains Inter-agency Group, composed of all the cooperating USDA agencies, to develop the policies and procedures. The same day Williams appointed Cyril Luker to chair the group and called a meeting of the state conservationists of the ten Great Plains states to work on the new program.[39] Assistant Secretary Peterson attended the first meeting of the Inter-agency Group on December 17 and reiterated what he expected from it. He emphasized that "short term activities must be consistent with the long-range objectives." Whatever the group developed had to have the understanding and support of the Great Plains Agricultural Council.[40]

Luker appointed task forces on information, cost-sharing and contracts, farm and ranch planning, and meshing the legislative authorities of the various agencies. The group sought and received advice from outside. Federal, state, and local officials and representatives from cattle and sheep raising groups and farm organizations held a January meeting in Denver to draw up suggestions. During the next weeks the task forces met and reported back to the full group with their majority and minority findings. Again Peterson met with the group and stated that the matters on which there was no unanimity had left the group on "dead center." The differing views should be documented and presented to him for resolution. Peterson resolved several issues at the meeting. The scheduling of practices was a technical matter and should be included in the farm plan, because the single practice concept conflicted with the long-range good of the program. Certification of installment of measures would be the responsibility of SCS.[41] As the work of the group progressed the Assistant Secretary was called on for additional decisions, the main one being whether SCS would serve as the contracting agency because it had responsibility for helping the owner develop the farm and ranch plan for the entire unit. Therefore, SCS should have responsibility for insuring that the practices were installed as scheduled and that they be maintained throughout the life of the contract.

The SCS people participating in drawing up the list of cost-share practices could draw upon over two decades of experience of working with farmers and ranchers. Also, managing the lands acquired under the land utilization program gave SCS technicians an opportunity to test various conservation measures. The conservation practices in GPCP accordingly reflected this field experience.[42]

Great Plains Inter-agency Group

Not surprisingly, the question of cost-sharing for irrigation came up for discussion. The majority of the Farm and Ranch Planning Task Force wanted to exclude irrigation, but J. B. Slack of the Farmers Home Administration and Jefferson C. Dykes of the SCS disagreed. They pointed out that irrigation was needed on some small ranches to achieve the goal of economic stability by providing supplemental feed. It would help bring about the desired land use change on the rest of the farm. The fear that it could encourage carrying more animals than the ranch could support would be corrected in the contract. The minority view prevailed, and irrigation was included.[43]

The matter of establishing the exterior boundaries for the program did not occasion much controversy. The criteria developed by the group included physical and climatic conditions that made crops undependable, erosive and deteriorated soils, and the need for land use change and conservation measures. The group solicited the states' suggestions on counties to be included under the criteria. Under this criteria, the boundary generally corresponded with the one proposed in the Great Plains Agricultural Council's program for the plains. As to which counties would initially be designated, the group added the element of local interest and initiative. It would be better to get the program off to a good start in counties where farmers were asking for assistance and then expand to the rest of the area.[44]

With many of the details worked out, those who worked on the program anxiously awaited the appropriations hearings. Peterson and Williams testified before the House Committee on Appropriations and requested $20 million per year. Again they were called upon to explain how the new program differed from the Agricultural Conservation Program. Peterson emphasized the hope that the money spent on GPCP would reduce the amount needed for emergency drought programs. The committee appropriated $10 million for the year.

In the months following the hearing, the group firmed up the policies and procedures, refined the list of practices, established the percentage of cost-shares for each practice, developed a handbook, and trained the SCS staff in drawing up

contracts. The work unit conservationist was well acquainted with developing conservation farm plans, but the element of contracting was new.

Beginning of GPCP

Berthold Sackman of Stutsman County, North Dakota, signed the first contract on December 19, 1957. The same day, Walter L. Wood and Robert H. Hunt of Gaines County, Texas, signed contracts.[45] These three and the subsequent contracts were to provide from 50 percent up to 80 percent of the average cost of conservation measures and included a schedule for the coordinated implementation of measures. The plans called for an assortment of complimentary conservation measures to stabilize the farm or ranch in accordance with the owners' objectives.

There were cost-sharing items for establishing vegetation on lands previously cropped and for reseeding range. Irrigation for pasture and forage, fencing, and development of water supplies supported the shift to rangeland and were designed to prevent overgrazing. Conservation measures for cropland included contour stripcropping, terracing, grassed waterways, land levelling, reorganizing irrigation systems, and windbreaks. The terms "permanent" and "enduring" were used to describe the conservation measures. GPCP architects hoped that farmers and ranchers would maintain the measures after the expiration of the contract. The fact that they were willing to pay part of the cost of installation boded well for long-range retention.

Such reluctance as there was on the part of owners centered on the contractual aspects of the program. Farmers had over twenty-five years of experience in dealing with government supervised acreage allotments and commodity price support programs. The notion of entering into a contract with obligations on both sides was a novelty. The work unit conservationists, as they were called in the 1950s, explained the new approach and pointed out the benefits.

Any reluctance to enter into a contract soon withered as farmers and ranchers saw the benefits neighbors derived from signing up. It was not long before the applications exceeded the amount of money available--a condition that has continued throughout the history of GPCP. By September 1959, twenty months after the first contract was signed, there were 3,142 contracts covering 8,597,385 acres with a federal obligation of $16,794,041. There were 2,579 applications for assistance in SCS offices throughout the Great Plains states.[46]

Limitation on Irrigation and Contract Size

Despite the impressive start, Williams and Luker found reason to reevaluate some aspects of the guidelines. Some of the early contracts had been larger than anticipated, with a substantial part of the funds going to irrigation. Actually, accelerated land treatment could be carried forward more rapidly under large contracts, but the trend held some dangers for the continuation of the program. With limited funds going into the large contracts, many applications would go unserviced. Eventually, there would be criticism that GPCP was only for large farmers and ranchers. Expensive irrigation construction could easily absorb most the money provided in individual contracts. There was a fear that the package of interrelated conservation measures for the whole land unit would be neglected and that critics would regard GPCP as a production, not a conservation program.

Williams and Luker proposed to the state conservationists in the Great Plains states that the amount spent on irrigation in individual contracts be limited to one-fourth of the contract with a $2,500 maximum. They developed a set of priorities to be used in selecting contracts to fund. Units having difficulty converting from cropland to permanent vegetation; units having wind and water erosion problems on rangeland or cropland suited to continuous cropping; and units having erosion problems requiring cooperative action by several owners would have priority. They further advised that the size of the farm or ranch should not determine the priority of assistance but that "a sufficient number of medium and small farms and ranches should be scheduled to

provide a representative balance in the use of resources."[47]

State conservationists Lyness Lloyd of North Dakota and H. N. "Red" Smith of Texas objected to the percentage limitation on irrigation practices. Lloyd stated that the change would hinder the stabilization of ranches while the conversion to ranching was being made. Irrigation was needed to provide cattle feed and pasture while former cropland was being returned to range.[48] Smith said the alteration in the program would reduce support for GPCP and eliminate a large part of the state from participation. He wrote, "The principal leadership in the Great Plains portion of this state have a strong interest in irrigation farming....The proposed fund limitation for irrigation practices would particularly eliminate irrigated cropland in this state from participation."[49] Objections notwithstanding the limitation of cost-sharing on irrigation practices went into effect. A year later on May 29, 1959, SCS placed a $25,000 limit on individual contracts.[50]

Protecting the Cropland History

The supporters of GPCP managed in 1960 to correct an aspect of the legislation which was viewed as an impediment. Some farmers who were willing to convert cropland to grass or to crops better suited to the land nonetheless wanted to retain the option of keeping the crop allotments and any payments due them. Public Law 1021 had protected the cropland history of the farm for the period of the contract. President Eisenhower signed Public Law 86-793 on September 14, 1960, to protect the cropland history for twice the length of the contract.

Diversity of GPCP Contracts

While the Washington office and state staffs wrestled with administrative and legislative details, significant progress in implementing conservation measures was taking place. GPCP contracts reflected the geographical diversity within the plains, the various types and sizes of agricultural units, and the objectives of individual farmers and ranchers.

D. H. and Charlene Dean of Claunch, New Mexico, made a total conversion from cropland to ranching. To convert 2,000 acres to grazing land, the Deans installed three ponds and three miles of water lines for livestock, six miles of cross fences, and controlled brush on 845 acres.

Rancher-farmers had more of a mixture of conservation measures for cropland and range. Walter Markel of Gray County, Kansas, had an 804 acre farm. He added 1,800 feet of diversions, installed 21,000 feet of terraces, and contour farmed and stubble mulched 231 acres. Thirty-nine acres were furrow seeded. For better grazing distribution he added 330 rods of fences. Markel had belonged to the local soil conservation district since 1949. He was in some ways typical of many who used GPCP to make progress on a farm conservation plan that they had envisioned for years.

GPCP contracts were used near Dumas, Texas, to solve flooding in the town. Ten farmers constructed 22,120 feet of waterways. In the process, 2,560 acres of irrigated cropland were also protected.

In addition to individuals, it was also possible for groups to sign contracts. A dozen FmHA-financed grazing districts in Montana held GPCP contracts in 1968. The contracts called for over 10,000 acres to be seeded and reseeded and for putting up 39,000 rods of fences. The reseeded range provided twenty-five percent more forage by 1968, with other acres remaining to be reseeded under the contracts.[51]

The use of a GPCP contract on the Dee Hankins farm in Wichita County, Texas, demonstrated the rehabilitation, both physically and economically, of worn-out land. The 815 acres (665 cropland, 140 acres rangeland 10 acres farmstead) had been sold six times in four years. Much of the farm was waterlogged and denuded because of salt deposits. The plan called for 65 irrigated acres, 267 dryland crop acres, 161 acres of irrigated pasture and 312 acres of rangeland. Concrete irrigation ditches were used for water conservation on the

irrigated part. Two hundred acres of waterlogged and salt denuded land was seeded to sideoats grama and native grasses. The acres planted in coastal Bermuda grass were hayed, grazed and provided strips of sod to sprig other farms. The farm became economically viable and remained so until Hankins sold it for suburban development.[52]

State Trends in GPCP Contracts

Although there was much diversity of conservation practices established on individual farms and ranches, there were some state and regional trends in the 1960s. Based on the percentage of total expenditures for each practice (1957-1972), North Dakota, South Dakota, Montana, and Nebraska led in establishing permanent vegetation on former cropland. Oklahoma and Texas were by far the leaders in reseeding rangeland. Only in North Dakota was stripcropping significant. That state also led in establishing windbreaks, followed by South Dakota. Leading in percentage expenditures on terracing were Kansas (30%), Nebraska (20%), and Texas (17.5%). New Mexico and Wyoming had the most activity in dam construction for erosion control, and Montana easily spent the most on water-spreading. Land leveling was most prevalent in Colorado and Kansas. Only Montana spent over 10 percent of its money on fences. Controlling invading mesquite and other undesirable shrubs was understandably highest in the two southwestern states, New Mexico and Texas.[53]

Congress Extends GPCP

The program had become so popular that each year's allocations to states were usually obligated early in the year for contracts that had already been written. As the expiration date of P.L. 1021 approached, farmers, ranchers, conservation district supervisors, and state officials hoped and worked for the extension of the program. All groups had some idea how the program might be improved, but the main objective was to have it extended. Most senators and representatives from the Great Plains states cosponsored the legislation. At the hearing before the House Committee on Agriculture, Congressmen George H. Mahon and Richard C. White of Texas and Thomas Kleppe and Mark Andrews of North Dakota testified for the extension. Several other congressmen inserted statements into the record. Norman A. Berg, Associate Administrator of SCS, testified for the Department of Agriculture.

Berg could point to 56,601,700 acres covered by 31,122 contracts. Thirty-seven percent of the funds had been spent to establish vegetation or for reseeding. The average contract had been about $3,500, covering 1,822 acres. Earlier Congressman Richard Crawford had inserted even more impressive information from "Red" Smith of Texas concerning the long-range objective of the program. A survey of the 4,050 expired contracts in Texas determined that 93.3 percent of the conservation measures had been maintained. Many of the 271 owners who had not maintained conservation practices did so in order to participate in commodity allotment and diversion programs.

Along with requesting the extension, Berg supported changes that would confirm the contribution the soil and water conservation districts had been making to GPCP. Farm conservation plans, developed with district assistance, had been used as the basis for contracts. The change in legislation acknowledged this arrangement. Another provision would allow contracts on non-agricultural land that had erosion. Enhancement of fish, wildlife, and recreation in the plains would be eligible for cost-sharing.[54]

At the 1956 hearings, only the National Farmers Union had supported the GPCP. Now the Farm Bureau and National Grange added their support to that of the Union. The National Association of Conservation Districts enthusiastically supported the extension. Lyle Bauer, Area Vice President, spoke for the extension and the provision to define the role of soil and water conservation districts. The House reported out the bill. After a conference to work out some changes suggested by the Senate committee, the legislation was signed on November 18, 1969. Public Law 91-118 extended the program ten years with a ceiling of $300

million and an annual budget not to exceed $25 million.

Boundary Extended

The House of Representatives hearings in 1969 created a new "legislative history" that allowed expansion of the exterior boundary. Most of the counties within the original boundary had finally been included. In fact, SCS had already added five outside the boundary. Within a month of the signing of the first contracts, SCS recommended adding an additional 22 counties. Donald Williams explained the situation to Assistant Secretary Peterson. "The interest of local people had not developed sufficiently to include this list of counties at the time the initial list was submitted for consideration July 3, 1957." By the end of 1958, the Secretary had approved another 78 counties.[55] Thereafter, there was steady growth until there were 417 designated counties on January 1, 1968. State conservationist "Red" Smith proposed in 1963 that the boundary be extended to include the western cross timbers where there had been wind erosion in the 1950s. He made a good case for the needs of the area. Williams responded that the legislative history would not permit such an extension and that, before any extension, the whole boundary should be studied. Furthermore there was already a backlog of applications, and the lower than authorized appropriations created a "need to concentrate the program in the 422 counties within the original approved boundary."[56] F. A. Mark summed up the feeling of the state conservationists. Unless additional funds could be had, any extension would "play havoc with needs in the existing authorized area."[57] The National Association of Conservation Districts favored extending the principles of GPCP but favored keeping the original boundary. The *Great Plains News* informed district members that the original boundary should probably have been drawn farther west in the northern plains and farther east in the southern plains. They asked rhetorically, "once the boundary is changed where can the stopping point be?"[58] With the new authority provided in the GPCP extension, the number expanded from 424 in January 1970 to 469 counties in 1972. The number remained there until Public Law 92-263, signed on June 6, 1980, extended GPCP for another ten years. Another 49 counties then entered the program, bringing the total to 518.[59]

Contract Size Increased

The matter of the limitations on contract size and irrigation costs have continually been discussed throughout the life of GPCP. On one side have been state and local people who favored an increase. But the administrators of the program have had to be attentive to criticism during the 1960s of large payments to individual farmers. The differences in the conservation program and its long-term goal and in commodity programs has not always been obvious to those unfamiliar with the specifics of the programs. The fact that plains farms and ranches were, of necessity, larger than those in humid areas has also led to misunderstanding. A group of state officials and other GPCP leaders suggested in 1975 that the contract limitation be raised to $40,000 and irrigation practices to $7,500. There was little consensus among the state conservationists responding to the proposal. Some wanted the increase; some did not. Some said that the change would neither hinder nor help GPCP. Interestingly, the attitude in Texas had changed. Edward Thomas, state conservationist, wrote that "some restraint is needed to keep the use of irrigation practices compatible with the legislative intent of the program."[60] The limitation remained in effect until Norman Berg, Chief of SCS, raised the limits to $35,000 total and $10,000 for irrigation in November 1980. By then, inflation had more than negated any effect the change would have had on the uniqueness of the program.

Special Practices

Some of the toughest administrative decisions have concerned approving "special practices." These are designed to allow flexibility for state and regional problems for which the standard GPCP cost-share measures are not adequate. Usually the requests are for sound conservation initiatives, but, nonetheless, are recurring, annual practices which do not meet the

criteria of being "enduring." Requests to cost-share for stubble mulching and planned grazing systems have been denied. Approval has been given to the construction of stock trails for livestock distribution, initial planting of tall wheatgrass for wind erosion control, and drip irrigation to get windbreaks established. Recently Norman Berg, Chief of SCS, approved conservation tillage as a special practice.[61] Considering the durability of farm machinery and the initial investment required, it would seem to fit into the "enduring" category.

Special Areas

The success and popularity of GPCP have been such that it inspired suggestions that other sections of the United States could benefit from similar programs. Programs for other specifically designated areas have not succeeded in Congress. The problem of wind erosion may actually have been a benefit in getting legislation enacted for the Great Plains. The dust storms that blew over cities in the 1930s and 1950s awakened urban residents to the problem in the plains and created a feeling of empathy. The deterioration of resources in other areas has not been as visible to persons outside the immediate area. Thus, these problems have not received similar national attention. But there has been one significant development. The Agriculture and Food Act of 1981, as reported out by the committees, included a special areas conservation program to "identify and correct erosion-related or irrigation water management" problems. If the law is enacted, the Secretary of Agriculture can provide technical assistance and share the cost of conservation measures. Under this program, the areas would not be designated in the legislation. The Secretary would have the discretion of selecting areas to participate.[62] It need hardly be noted that the record of GPCP convinced senators and congressmen of the value of a similar program for their states.

Other USDA Programs

Throughout the life of GPCP, there have been suggestions and attempts to merge GPCP with other cost-sharing programs. The argument that has spared GPCP from merger or elimination has been SCS's ability to demonstrate the necessity of linking cost-sharing, technical assistance, and good farm and ranch management to attack a special problem in a special area.

Various cost-sharing and loan programs administered by different agencies need not overlap or create rivalries to the detriment of the conservation effort. During the GPCP Inter-agency Group meetings, the Farmers Home Administration offered to adjust its loan procedures to fit GPCP. This adjustment made it possible to advance FmHA loans in consecutive years to owners and, thereby to assist in carrying out the conservation plan under GPCP. The eligibility of GPCP participants for conservation reserve payments under the now expired soil bank, the long-term agreements, and ACP payments administered by the Agricultural Stabilization and Conservation Service has varied through the past twenty-five years. Cost-sharing funds under ACP could contribute to achieving conservation farming and ranching. However, the Agricultural Stabilization and Conservation Service (ASCS) ruled that after January 1, 1979, participants in GPCP would not be eligible for the ACP cost-sharing program.[63] Prior to that time the ability and willingness of the SCS district conservationist and the FmHA and ASCS representatives to develop a working relationship has been crucial to coordinating programs for the best effect.

The matter of meshing acreage allotments and the commodity price supports that go with them has been of greater concern to those who framed or directed GPCP. Generally, these programs were regarded as being incompatible with the objectives of GPCP because these programs encouraged farmers to plant land to crops that were better suited by capability to grassland or less erosion inducing crops.

In assessing the impact of acreage allotments, one must consider the total effect of farm prices on conservation. The experience of the late 1920s and early 1930s is illustrative. When farmers who have mortgage payments to meet are faced with declining commodity prices or prices that do not keep

pace with inflation, the tendency is to expand production to reap an ever diminishing profit on each acre--regardless of the capability of the land. Without endorsing a particular commodity price system, it should be recognized that a healthy and stable agricultural economy is conducive, even necessary, to good conservation farming and ranching.

The Part of GPCP in SCS History

The Great Plains Conservation Program has been significant in the development of SCS and can be regarded as a third era in its history. The agency began operations through demonstration projects and provided WPA and CCC labor, seed, plants, equipment, and other supplies. The Service then shifted to working through conservation districts. The labor, equipment, and supplies ceased being available with the onset of World War II. The conservation effort then rested on the ability of conservation district supervisors and SCS conservationists to convince land owners of the benefits of conservation. The Small Watershed Act (1954) and GPCP provided SCS with the inducement of cost-sharing to accelerate the conservation work with local governing bodies and individuals. The lessons learned on contracting and cost-sharing in GPCP have been the model used for land treatment in Small Watershed Projects, the Resource, Conservation and Development Program, the Rural Abandoned Mine Program, and the Rural Clean Water Program.

GPCP also changed the role of the individual SCS conservationist to a limited extent. The GPCP contract was much like a good conservation farm plan, only more detailed. Under the contractual arrangement, he had to certify that both parties, government and individual, met their obligations. Insuring compliance with some aspects of a contract, such as preventing newly seeded range from being grazed too soon, was a new task for the conservationist. These new management roles brought a closer working relationship between the conservationist and the farmer that eventually benefited the land. Not only did farmers and ranchers learn better farm and ranch management techniques, but also the expertise of the conservationist increased. Improved stewardship of land has resulted.

The contract between the individual and the government has been the aspect of GPCP that made it unique. SCS technicians annually reviewed contracts to insure that cost-sharing monies were spent and practices maintained as specified in the contract. Although breaches of contracts were the exception, SCS in some cases cancelled contracts and collected payments made to violators. Such vigilance, combined with a willingness to make changes in contracts when justified, early established the reputation of GPCP as a unique conservation program.[64]

A Unique Conservation Program

The burden of keeping GPCP attuned to its objective also fell on the administrators in the Washington office. During the last twenty-five years, national agricultural policy has fluctuated between using various programs to promote production of commodities and de-emphasizing production programs to reduce surplus commodities. It is usually expected that all agricultural programs be adjusted to the goal. GPCP has had to operate in the varying climate of national agricultural policy and yet retain its objective. As SCS and the National Association of Conservation Districts were preparing in 1968 to ask for an extension of the program, William Vaught, supervisor of GPCP operations, spoke to the Great Plains conservation district leaders about retaining the uniqueness of GPCP.

> Don Williams, in maintaining a personal interest in the program, has held steadfast over the years in his efforts to keep faith with Congress. And I might add that it has not been an easy thing to do. He has been under constant pressure to relax some of the restrictions....as we move into the process of attempting once again to solicit the support of Congress...we can be

> thankful for his determination. I think we have kept the faith with Congress and its intent to provide a unique program--regional in nature--to help us solve those tough wind erosion problems.[65]

The succeeding administrators, Kenneth Grant and R. M. Davis, kept the program on course. The present Chief, Norman Berg, "grew up with the program" and knows the elements that have to be retained to keep it unique. The administrators and chief have relied on specialists to advise and carry out the daily operations of GPCP. Cyril Luker started the program as head of the Inter-agency Group and was followed by Norman A. Berg, William L. Vaught, John W. Arnn, Julius H. Mai, John J. Eckes, and Guy D. McClaskey.

Impact of GPCP

Of necessity, the success of the program must be judged in terms of the land and its condition, compared to the 1950s. What happened to the land? SCS estimated in 1956 that between 11 and 14 million acres were in cultivation in the plains that should be in grass. SCS had to estimate the figure because soil surveys and land capability studies had not been completed. Before the enactment of P.L. 1021, the Service increased the hiring of soil scientists for surveying the plains states. Furthermore, the state conservation district associations concurred in plans to shift experienced soil scientists from the prairie and mountain sections to the plains to accelerate the soil surveys.[66] By September 30, 1980, 2,869,062 acres of former cropland had been converted to grassland. An undetermined percentage of this has reverted to crops since the expiration of contracts. Developments in conservation tillage and drought resistant crops have reduced the hazards of cropping marginal lands. With the need to spread the use of conservation tillage, it is desirable not to present it as the new "panacea' that makes complementary conservation measures unnecessary. Drought resistant crops have been of great benefit in controlling wind erosion. However, if the drought is so prolonged on some sandy land that spring germination is impossible, it will make little difference whether the seeds are of drought resistant varieties or not.

Other questions surround the success of GPCP. Did irrigation for pastures and for forage make cattle raising possible for ranchers who did not own enough land for dryland ranching? Have we seen the last of the wild fluctuations in the number of cattle on the range during droughts and good years? Has the program halted the cycles of migration out of the plains during droughts and land speculation in the good years that resulted in each succeeding generation repeating the mistakes of the past? Were farmers and ranchers better able to withstand droughts? Studies in North Dakota and South Dakota indicated that this was the case. In short, did GPCP bring about the agricultural and resource stability promised in 1956? A study of these questions and others would be of interest on the county, state, and regional level. All of them may not be answerable by quantification, or by the numbers. Many who participated in GPCP as farmers, ranchers, district conservationists, or conservation district supervisors believe that the judgment is in the affirmative, or partially so, on many questions.

Donald Williams recently summed up his dual feelings of success and frustration over the conservation movement in general. "It seemed like we would get to a certain point and then something would happen. The war would break out. The price of wheat would go up, and the farmers would go out and plow up the land again. So there you are; you had to back up and start over again in a way. But we never went clear back to where we were before. We had a better starting point so that we were able to get ahead."[67] No doubt many regard GPCP as a significant development in the push to "get ahead" with conservation work.

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New Authorities and New Roles: SCS and the 1985 Farm Bill

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Since passage of the Soil Conservation Act in 1935, the U.S. government has tried in various ways to promote soil conservation. Federal policy-makers have promoted research; created an agency of technically trained people to carry soil conservation information to the farming community; encouraged the growth of conservation districts; shared in the cost of establishing soil conservation practices on farms and ranches; and tried innovative approaches, including long-term contracts, such as those in the Great Plains Conservation Program.

Title XII, Conservation, of the Food Security Act of 1985 (Public Law 99198), added a new array of soil conservation provisions designed to link soil conservation to eligibility for other U.S. Department of Agriculture (USDA) Programs. The framers of the various clauses especially wanted to eliminate the possibility that commodity price support programs encouraged poor soil conservation practices or the loss of wetlands.

The Environmental Movement Extended

Inclusion of provisions in the 1985 farm bill to reduce soil erosion can be seen as an extension of the environmental movement. Traditional soil conservation groups, the National Association of Conservation Districts (NACD) and the Soil and Water Conservation Society (SWCS); USDA officials who were favorable to the concept; members of Congress and their staffs; and academics all contributed. But major changes in legislation require active lobbying from some groups. The environmental groups' new emphasis on soil erosion was not a turning of attention away from earlier issues, such as preserving woodland, wild rivers, wetlands, and reducing pollutants in air and water. Rather, it represented a wider view encompassing agricultural land. Many individuals and organizations in the environmental movement who lobbied for the act are now monitoring the progress. They and the older soil conservation groups--NACD and SWCS--came to be known as the "conservation coalition."

While soil erosion would undoubtedly have attracted the attention of environmental groups eventually, events in the U.S. farm community accelerated the process. In the early 1970s, only a couple of years after passage of the National Environmental Policy Act, events brought soil erosion to the attention of the public. After several decades of U.S. agricultural surpluses, grain prices began rising in the early 1970s as the Soviet Union purchased large quantities. Grain exports in 1973 were double those in 1972. Prices of wheat, soybeans, and corn in 1974 were 208 percent, 133 percent, and 128 percent, respectively, of what they were in 1970 (2). In response, USDA eased production controls, including the requirement that "set-aside" be held out of production as a condition of participation in price-support programs. Secretary of Agriculture Earl L. Butz proclaimed, "For the first time in many years the American farmer is free to produce as much as he can" (5).

USDA encouraged production in the belief that increased foreign demand was a long-term trend that might well make price supports and production controls unnecessary. Early on, the rush to produce also threatened some long-established conservation measures. By late 1973, according to Butz, USDA was receiving reports of the "heedlessness of some producers." He wrote in the *Journal of Soil and Water Conservation* that reports from the northern Great Plains told of "plowing up grassed waterways, shallow hilltops, and steep

slopes...and tearing out windbreaks that took many years to establish." From the southern Great Plains, there were "reports of speculators breaking ground and preparing to plant cotton on thousands of acres of native rangeland that have never been used for crops before" (5). Farmers converting to irrigation did remove wide windbreaks, but, later, an SCS survey found that new plantings of narrower windbreaks had more than offset windbreak losses in most Great Plains states during the period 1970 to 1975 (28). Whatever the actual magnitude of the loss, aerial views of the shifts from some older, wide windbreaks to irrigation systems vividly illustrated what took place.

An SCS survey of cropland expansion in July 1974 found that farmers had converted 3.6 million acres of grassland, 400,000 acres of woodland, and 4.9 million acres of idle land to cropland. About 4 million of the 4.9 million converted acres had inadequate erosion control. At the time, public attention centered on the Great Plains, but land conversions took place in all regions. The eroding land was scattered throughout the United States, with the heaviest concentrations in the Corn Belt, western Great Plains, southern Coastal Plain, eastern Piedmont and Coastal Plain, and the southern High Plains (15). During the early 1980s, the prospects that domestic and export demands might absorb all U.S. production would prove illusory as good crop years worldwide and loss of markets, in part because of crop embargoes, took a toll. But the trend that began in 1973 continued. Food and feed grains were planted on 294 million acres in 1972, 318 million acres in 1973, 326 million acres in 1974, and 363 million acres in 1981 (41). Thereafter, cropland devoted to food and feed grains went into a slight decline.

Total land in crops had declined in the 1950s and 1960s. The land brought into production during the 1970s and early 1980s actually restored the U.S. cropland base to its level immediately following World War II. It was not the same cropland in all cases because some cropland was converted to other uses. The expansion involved some land not used for production over the past 40 or so years (16).

The expansion of acreage in grain crops also turned people's attention to soil erosion. Questions arose about the wisdom of expanding grain production for export, hoping to reduce the balance of payments, but at the same time causing more soil erosion as a consequence. Was this a case of mortgaging the future? While some of the attention focused on trade and agricultural production policies, the effectiveness of soil conservation programs also came under scrutiny--both the technical assistance activities of SCS and the financial assistance programs administered by the Agricultural Stabilization and Conservation Service (ASCS). In the late 1970s the General Accounting Office (GAO) issued several reports on conservation activities, including *To Protect Tomorrow's Food Supply, Soil Conservation Needs Priority Attention*, which reviewed the Agricultural Conservation Program (ACP). ACP provided cost-sharing money for soil conservation practices with farmers. Critics of the program believed much of the cost-share money was spent not on soil conserving practices but on practices that enhanced production of crops that were already in surplus and costing the government through price support payments. A related criticism was that the more prosperous farmers, often owners of the best land, were in a better position to take advantage of cost-sharing; thus, much of the money was spent on less erodible land rather than on the land most at risk. Finally, program reviewers believed that both the ACP funds and SCS technical assistance should be targeted to the most critical erosion areas, rather than being distributed evenly across the country (11, 25). Some of the criticism was ahistorical, taking the view that little had been done in the way of conservation in the past. That view gave little recognition to shifting gains and losses over time in the soil conservation movement.

Congress' most significant act in response to the concern over soil erosion, however, was passage of the Soil and Water Resources Conservation Act of 1977 (RCA). The RCA

process, as it came to be called, required the USDA to report to Congress on four interrelated topics: the status and condition of America's natural resource base, the present and likely future demands on these resources, the programs needed to protect and enhance these resources for sustained use, and any new approaches that may be needed (12). Government observers in the United States often scoffed at the prospect of another study as a way of evading a difficult issue. In retrospect, the RCA seems to have become one of the instrumental factors in passage of the conservation provisions of the 1985 farm bill. Previous studies of conservation needs by SCS had concentrated on identifying conservation problem areas and needed conservation work. The studies started under RCA concentrated on quantifying soil erosion. Earlier, in the Rural Development Act of 1972, Congress provided for a continuing land inventory and monitoring program that collected information for the RCA studies. The National Resources Inventories (NRI), which became linked to the RCA process, had compiled information on land cover, small water areas, flood-prone areas, irrigated land, conservation needs for various land uses, water erosion, wind erosion, prime farmland, potential for new cropland, land capability classification, and wetlands. The availability of this information, as well as the public comment process established under RCA, provided a forum for numerous individuals, organizations, other government agencies, and academics to express their opinions. The inventories supplied the raw material of analysis and debate. Conferences and special volumes flourished as soil erosion became one of the main environmental issues in the late 1970s and early 1980s (37, 38).

Austerity Begets Targeting

Under RCA, USDA analyzed the data and submitted a program of recommendations to Congress. It fell to the incoming USDA administration in 1981 to complete the proposed program and forward it to Congress. The formulation of the program and the discussions of legislative initiatives took place in a climate in which there would be little additional money for soil conservation; rather, there might be less. As Congress, USDA agencies, and public interest groups debated the final RCA report and recommendations, Congress completed the 1981 farm bill (12). The Agriculture and Food Act of 1981 (Public Law 97-88) included several major conservation provisions.

The Farmland Protection Policy Act sought to minimize "the extent to which federal programs contribute to the unnecessary and irreversible conversion of farmland to nonagricultural uses." Throughout much of the 1960s and 1970s, the continuing loss of fertile and generally fairly level land, especially "prime farmland," to development meant that the major soil conservation topic was prime farmland and planning development in agricultural areas, rather than soil erosion. The National Agricultural Lands Study, an interagency-sponsored study of the problems and issues, was completed in early 1981 (9, 29). Another provision of the act, the Conservation Loan Program, made it possible for farmers to borrow from the Commodity Credit Corporation to install conservation practices. The Matching Grants for Conservation Activities would go to local units of government through state soil conservation agencies. The RCA report submitted to Congress had included matching grants. The Special Areas Conservation Program would accelerate technical and financial assistance to farmers and ranchers in areas with severe soil erosion or other resource problems. USDA would contract with farmers or ranchers to carry out conservation. SCS, in the Great Plains Conservation Program, had developed long-term contracts with farmers covering the whole farm or ranch that served as a model for the special areas program. The information gathered in the RCA process to identify soil erosion problem areas would be used to identify special areas. USDA did not include special areas in the report submitted to Congress, but Congress added a section on it (19, 30).

The administration did not request additional funds for the matching grants and special areas. The RCA recommendations, however, included a proposal on

"targeting" as another way to direct funds and people to problem areas. USDA did not have additional funds for special areas, but did start a targeting program. The action came under existing law and did not require legislative authority. The RCA report to Congress recommended that soil conservation programs be moved away from the traditional first-come, first-served allocation and shifted to designated resource problem areas where excessive soil erosion, water shortages, flooding, or other problems threatened long-term agricultural productivity. SCS and ASCS were to devote an additional five percent of their technical and financial assistance to the targeted areas until 25 percent of their funds were going to targeted areas (39, 40). From its national office, SCS designated 10 targeted areas in 1982. In 1983 the states submitted proposals for additional targeted areas.

In 1983 SCS undertook another program to shift resources to problem areas. The areas of the country that created soil conservation districts early on had laid claim to SCS people and funds because the agency worked through districts. But years later, in the 1980s, the areas with the greatest concentration of SCS personnel did not tally with the greatest erosion problem areas being identified in studies. SCS began adjusting the formulas for allocating funds and personnel to states by giving greater weight to resource problems. In cases where the one or two people stationed by SCS at the district office constituted the major part of the operation, the changes seemed ominous. Also, districts tended to see themselves as having a broader natural resource role than just soil conservation. At any rate, when Congress heard from the districts, the issues of targeting and adjusting the formula for allocating monies to states had become inseparable. Congress in 1984 froze the adjustments (23, 24, 34). Under the conservation provisions of the Food Security Act of 1985, the obligation to make highly erodible land and wetland determinations and to help farmers with conservation plans caused SCS to put people and resources where they were most needed.

A Changing Climate

Meanwhile, other events shaped the legislative climate in which the conservation sections of the 1985 farm bill would be considered. The Great Plains, scene of the renowned Dust Bowl of the 1930s, provided some of the impetus. Between 1977 and 1982 wheat farmers planted large tracts of grassland in Montana (1.8 million acres), South Dakota (750,000 acres), and Colorado (572,000 acres). In some places the resulting wind erosion proved a nuisance to neighboring farmers as windblown dust covered irrigated pasture and piled up against fences. Some vocal and effective local landowners wanted action, especially Edith Steiger Phillips of Keota, Colorado. She persuaded county commissioners in Weld County to take action against out-of-state interests who plowed up adjacent grassland for wheat production (33). She and others created sufficient sentiment for action that Colorado Senator William Armstrong introduced a bill (S. 1825) in 1981 that would deny USDA program benefits, including price support payments, to farmers who converted fragile land to cropland. The bill applied only to land west of the 100 meridian that had not been in crops during the preceding 10 years. Owners would not be eligible for price supports on that land unless they entered into a long-term agreement with the secretary of agriculture to protect it with soil conservation practices. The bugabear of outside investors looking for tax breaks and a quick return on investment usually showed up in discussions of the Great Plains and soil conservation. Certainly, there were some large operations, but surveys conducted after the outcry indicated that Coloradans had owned most of the converted land for some time before planting it to small grains. They responded, it seems, to the prospects of more profit in grain production than from rangeland (18, 20).

The Armstrong bill, dubbed the "Sodbuster Bill," did not become law in its first version, but it did occasion congressional hearings and furthered discussion. The Colorado Cattlemen's Association, the American Farm Bureau Federation, and traditional soil conservation and environmental groups testified in favor of the bill.

The grassroots actions to support legislation gave greater credence to Washington-based pressure for linking soil conservation and commodity programs. In addition to Weld County, other counties in Colorado and Petroleum County in Montana passed ordinances to try to prevent plowing of native grassland (20, 26).

The bill provided a forum for the conservation groups to promote a broader conservation section. NACD, for example, testified that denial of participation in USDA programs because of sodbusting should not be limited to price-support programs. Other suggestions further defined the marginal land in terms of land capability classification and set in process an attempt to define fragile land and, eventually, highly erodible land (17).

In 1981 Senator Armstrong incorporated many of these suggestions in an amendment, "Agricultural Commodity Production on Highly Erodible Land," to an agricultural appropriations act. It passed the Senate but was eliminated in the conference committee (35). In the next congressional session he introduced S. 663, "Prohibition of Incentive Payments for Crops Produced on Highly Erodible Land." The bill still pertained to sodbusting, or land that had not been cultivated during the past 10 years. The sodbuster bill drew wide support from such organizations as the American Farm Bureau Federation and the National Farmers Union. Peter C. Myers, chief of SCS, spoke for the department in support of the bill (36).

During 1983 there were additional hearings on the sodbuster and other soil conservation initiatives that eventually came to be included in the farm bill. While USDA supported the sodbuster provisions, the department consistently held that soil conservation initiatives in other bills introduced in 1983 and 1984, such as a conservation reserve program or a certified voluntary set-aside, should await consideration of the 1985 farm bill (32).

During the interim period between the 1981 and 1985 farm bills, the PIK (Payment-in-Kind) program provided an example of how farm programs could deflect conservation aims. USDA needed to reduce crop surpluses to boost prices and hopefully reduce the cost of price support programs. Out of several options, USDA officials in the early 1980s selected PIK, just one of several tools at their disposal that could be used in price support programs. It offered the possibility of reducing crop surpluses, which were depressing prices, by paying farmers in-kind, with farm commodities, to reduce their planted acreage. Proponents of tying conservation to the farm programs often held that commodity programs encouraged farmers to push their cropland base to the limit in order to be able to participate in annual set-aside programs. Conversely, farmers who voluntarily put erodible land into pasture, forests, or cover crops found that such land was not eligible for programs like PIK. The voluntary set-aside, a key element in some bills introduced in Congress, sought to address this problem. Reports that the "conservation-use acres" under PIK achieved less for conservation than projected also highlighted the problems of programs in which conservation was a secondary benefit (3, 9, 22).

Another Opportunity

The 1985 farm bill provided the next opportunity to incorporate conservation into agricultural programs. Developments in the farm economy also made for some significant changes. U.S. farmers had lost significantly in export markets. During the embargoes on grain to the Soviet Union, other countries increased production and exports. The rising value of the dollar further weakened the American farmer's position as an exporter. Farmers were caught in the price-cost squeeze, especially those who had bought land and equipment in the 1970s and who were faced with long-term, high interest loans on land and equipment whose value had declined. The percentage drop in farmland values in the five years after 1981 was the greatest for any five-year period since the Civil War (21). Many farmers had little borrowing equity for operating loans. In such a climate the security of price support programs became crucial. With the dramatic increase

in the cost of commodity programs ($17.7 billion in fiscal year 1985), the administration began looking for ways to reduce costs in the future. Not only were individual farmers in trouble, but the whole farm credit system administered by USDA and the Farm Credit Administration was tottering. All these matters required attention from Congress (4).

Urban interests had for some time bargained with farm state representatives in giving their support to agricultural programs. In some cases, the legislation benefited both sides, as in the school lunch and food stamp programs. In what turned out to be a very prophetic analysis, Don Paarlberg, an agricultural economist who served in the Eisenhower, Nixon, and Ford administrations, reasoned at the beginning of the Reagan years that the food programs were popular enough to stand on their own. The newer scenario was more likely to be urban congressmen voting for farm legislation if that legislation included performance in soil conservation provisions (31). The Paarlberg prophecy came to pass in the 1985 farm bill. The conservation coalition, representing the traditional environmental groups with urban support and the primary soil conservation organizations, mobilized their forces for a strong conservation section.

The conservation provisions were tied to USDA programs. Any sort of government intervention has never been popular with the farming community. But the proponents had several ready arguments. Farmers did not have to participate in programs; so conservation seemed an equitable trade for public taxpayer support of farm programs. Also, experience and years of analysis of USDA programs pointed out how conservation programs and price support programs worked at cross-purposes. The conservation programs had encouraged voluntary dedication of land to its best uses, frequently to less intensive uses, such as pasture, hay, and rangeland. Another element of public support brought about adjustments through rental or contracting arrangements. But the price support programs sent the message to farmers that they should maintain their cropland base in order to participate to the maximum in price support programs. There was less incentive to adjust production to price or to make the land use changes that matched land to its best uses. In a sense, farmers who voluntarily retired land to less intensive uses were penalized because they reduced the size of their potential payments under commodity programs.

The framers of the conservation sections in the 1985 farm bill had years of experience and observation and studies to rely on in writing the provisions. There had been congressional hearings on various bills after 1981. Many of the provisions that eventually appeared in the bill were laid out earlier in a report, "Soil Conservation in America: What Do We Have to Lose?", issued by the American Farmland Trust (1). Coalition members presented extensive testimony early in 1985 before the Senate Agriculture Committee. Some of the more active participants included Ken Cook, now of The Conservation Foundation, Bob Gray of the American Farmland Trust, Norm Berg, Washington representative for SWCS, Maureen Hinkle of the National Audubon Society, Neil Sampson of the American Forestry Association, Charlie Boothby of NACD, and Justin Ward of the Natural Resources Defense Council. In mid-March Sierra Club lobbyists Dan Weiss and Rose McCullough and club members visited hundreds of members of Congress to press their conservation agenda. The group had also worked with USDA officials. The movement to link conservation with commodity programs benefitted from the presence of two strong conservation advocates in the department in John Block, secretary of agriculture, and Peter Myers, chief of SCS and, later, assistant secretary for natural resources and the environment. Block had earlier announced that he believed use of soil-conserving practices was a reasonable request to make of farmers receiving USDA assistance. Myers served as the liaison to Congress and reported weekly to John Block. Wayne Chapman of SCS, who was serving as a legislative fellow with the House Committee on Agriculture, provided communication between the Congress and the department. Numerous individuals in SCS and other USDA agencies provided

analysis on various provisions included in the bill (6, 10).

Under the support and chairmanship of Congressman Ed Jones of Tennessee, the Subcommittee on Conservation, Credit, and Rural Development of the House Committee on Agriculture had long been the incubator for new soil conservation legislation, including many forerunners of the conservation provisions in the 1985 farm bill. During April 1985, Senator Richard Lugar of Indiana chaired sessions of the Senate Committee on Agriculture, Nutrition, and Forestry on the reauthorization of the 1981 farm bill. At these meetings the conservation coalition laid out its agenda.

The Matter of Implementation

As with many laws, it was not the framing of the law but the writing of rules and guidelines for implementation that has created the most debate and disagreement. SWCS sponsored a special conference, "American Agriculture at the Crossroads," in the fall of 1987 to discuss implementation issues (27). There have been some disagreements over how rigorously the Conservation Reserve Program (CRP) should be restricted to the most highly erodible land; the uses of the CRP land, especially for grazing and hay; the treatment of cover crops, such as alfalfa in a crop rotation, under conservation compliance; the definitions of wetlands for swampbuster; and, finally, the implementation of conservation compliance.

Probably the most difficult jobs in implementing the conservation provisions have been those of the SCS soil conservationists in field offices who work directly with farmers. Excluding the national office, four technical centers, and the state offices, there are about 7,000 SCS employees in the field. SCS estimated that work on the conservation provisions would require about 70 percent of that staff's time until 1995. To date, much of the time has gone to making highly erodible soil determinations; updating field office technical guides with conservation systems for that particular region, its soils and traditional cropping patterns, and writing conservation plans. A field is considered highly erodible if one-third of its soil map units, or as much as 50 acres in it, are highly erodible. About 120 million acres on 1.7 million out of the 2.3 million farms in the United States are affected. SCS concentrated first on conservation compliance and is now turning its attention to making wetland determinations. Of the estimated 70 million acres of wetlands, about 5 million acres have potential for conversion to cropland and thus are affected.

Not only has there been a high work load, but there has also been the stress associated with rendering unpopular options. Conservation compliance has resulted in a role change for soil conservationists. They can still be, as they have been in the past, friends with farmers. But at times they may need to make determinations on highly erodible land or wetlands that are unwelcomed. The ability to work with the farmer toward a mutually acceptable solution is a challenge for soil conservationists. Because of this need, states have begun to focus more of their training for field office employees on stress management, conflict resolution, and public relations skills to prepare them to deal more effectively with the publics that they serve.

The Food Security Act also has some implications for the work of SCS. Operating soil conservation programs under the conservation provisions will lead to greater integration of economic analysis into farm conservation planning and the design of conservation practices. The process has already started. Researchers in experiment stations have, from the early days of the soil conservation movement, undertaken economic analysis of soil conservation programs to assist farmers and to promote the programs. At other times, researchers have tried to analyze motivation to reveal why farmers adopt conservation practices. Will farmers adopt conservation practices only if it can be demonstrated conclusively that they are profitable? Are farmers significantly motivated to adopt conservation practices by the conservation ethic? What needs, other than economic viability, do

farmers have that may provide the incentive for conservation? Future analyses of the response to conservation compliance legislation may provide some answers to these questions. Conservation compliance focuses more attention, both on the part of the farmer and SCS, on the benefits, costs, and motivations involved in soil conservation.

Also, the economic aspect should influence the range of options available to farmers. That is to say, it should influence the design of conservation systems. One criticism of soil conservation practices has been that too often practices have not been designed for small farmers with limited resources. This, of course, is not a new concern. When speaking of working with minority groups, Kenneth E. Grant, then administrator of SCS, said in 1972, "We may have to invent ways to install practices that do not require expensive specialized equipment or costly materials" (14). The number of minority farmers has continued to decrease drastically, but there have been significant increases in the number of small and part-time farmers. With conservation compliance, the need exists to design systems and practices for limited-resource farmers and part-time farmers that are economically feasible. Economists should be involved, along with the engineers, agronomists, and earth scientists, in working out a whole range of options with varying degrees of effectiveness and cost efficiency.

Conservation compliance also provides an opportunity to reduce the gap between conservation measures planned and conservation measures applied. Of all the people SCS assisted with conservation plans in 1968, only 65 percent actually applied at least one conservation practice. A few years later, the figure had dropped to under 60 percent, and, indeed, 65 percent was viewed as a reasonable goal (14).

A little historical perspective on this matter is in order. When Hugh Hammond Bennett was successful in securing emergency relief administration funds to conduct demonstration projects in 1933, there were other competitors for conservation funds. Bennett successfully argued against an emergency terracing program and made the case that there was more to soil conservation than terracing. When the Soil Erosion Service started contacting the farmers in demonstration project areas, they worked out conservation plans for the whole farm. The concept was and is good. But the agency has still had to struggle with a couple of problems. First, in judging progress in soil conservation on the land or the employee's effectiveness, completion of plans could too readily be confused with accomplishments. Conservation compliance has changed the focus. The farmer is more likely to look at his or her operation as a whole when making decisions about the crop rotations, cover crops, and other aspects of a conservation system. Planning and application of conservation practices should correlate more closely than ever before.

The Food Security Act should also lead to greater coordination of SCS recommendations to farmers with advice to the farmers from other federal agencies and the state extension services. Again, the historical reasons are illustrative. The early proponents of SCS argued successfully that attention to soil conservation from USDA was lagging and that a separate agency was appropriate. Opponents of a service devoted solely to soil conservation held that soil conservation was only one aspect of farm management. Any assistance to farmers in soil conservation should be delivered along with other assistance in animal or crop production and the other facets of farm management. But SCS has maintained its independence. In delineating responsibilities within USDA to avoid conflicts soil conservation has been treated as a separate component of farm management. Admittedly, the boundaries were blurred. With the requirements of conservation compliance, farmers are likely to insist that USDA speak with one voice and that farmers receive information on soil conservation that is coordinated with advice on other farm matters that they received from other agencies.

The Food Security Act emphasis on linking soil conservation to other assistance available from USDA and trying to add some consistency to program objectives is only the latest of numerous devices tried. We--society--have relied on research, science, technology, and education in delivering information on soil conservation directly to farmers. As a society we have helped pay for conservation through cost-sharing. Through purchase or rental, we have tried to retire or change the uses of erodible land. Appeals to farmers have varied from stewardship to profitability as a reason for soil conservation. None of these ways to promote soil conservation proved a panacea, but all had and have merit. The results of the conservation provisions have not run their course. In our complex society we dare not hope for perfection. But we can recognize the legislation as a significant addition to the quest and our work toward an enduring agriculture.

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Agriculture That Fits the Environment: A Look Backward and Forward

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The search continues for an agriculture that fits the land as well as maintains it. Public opinion polls increasingly identify the environment as a major public concern.

Through legislation passed by Congress and signed by the President, this concern has been translated into action affecting numerous aspects of life in the United States--including life on the farm. Within the past decade, laws such as the Food Security Act of 1985, the Clean Water Act amendments of 1987, and the Conservation Program Improvements Act of 1990 (part of the 1990 farm bill) called for modifications in programs and development of new ones in USDA. The intent of the new laws is to ensure that USDA's programs are compatible with our environmental objectives.

But, if we are to maintain environmental quality, we must have a mechanism and a source of knowledge to turn legislative intent into action on the land. Fortunately for the American public and American farmers, earlier concerns over soil and water conservation led to a system that helps producers farm efficiently while still meeting environmental objectives. Without the scientific research, the practical experience, and the development of institutions at the local, State, and Federal level, public concerns about the environment would be far more difficult to translate into action at the farm level.

Looking Backward

New crops, new climates, virgin soils, and new social and governmental systems influenced agriculture. Conversely, agriculture influenced the environment. It wasn't long before perceptive people could recognize that the meshing of agriculture with the environment of North America was not completely harmonious.

During the 18th and 19th centuries, Americans borrowed and developed methods for soil conservation. Growing concerns in the 20th century led to the development of Government programs to help farmers use the soil while at the same time reducing erosion. Starting in 1929, USDA focused on research, setting up experiment stations to test methods of soil conservation.

The Soil Conservation Act of 1935 established the Soil Conservation Service (SCS) to work with farmers. With the encouragement of President Franklin D. Roosevelt and USDA, States passed laws to allow farmers to create conservation districts. Since 1937, farmers, ranchers, and other landowners have created nearly 3,000 conservation districts and, all along, the SCS has had trained soil conservationists working with these local conservation districts and the farmers. It is this system--the experience, knowledge of land and resources, familiarity with the local landowners, and governmental institutions--that makes it possible to shape on-farm management to meet national goals.

At the same time SCS was developing expertise in soil conservation, some developments in agriculture did not bode well

for conservation. Part of the problem was the increasing specialization of agriculture. The mixture of cropland and livestock had allowed for many conservation techniques, such as using the steeper lands for pasture and hay, rotating crops, and interspersing close-growing crops into strip-cropping to retard runoff. But increasingly, American farms specialized in a few crops or in livestock.

USDA's commodity price support programs also affected soil erosion. For some time, people believed that some USDA programs had encouraged poor land use. In the 1930s, during a time of low prices for agricultural commodities, laws such as the Agricultural Adjustment Act of 1933 set up a system of price support payments to farmers. The payments were supposed to help maintain supplies and prices, thereby leveling out the peaks and valleys of prices and supplies of agricultural commodities. Fifty years later, critics of USDA programs held that these programs, including crop insurance, encouraged farmers to keep very erodible land in production. A larger issue involved fairness, and the feeling on the part of many that farmers should use methods that conserved resources if they were to receive financial assistance.

Recent Legislation

The National Environmental Policy Act of 1970 addressed some USDA programs, but by no means all of them. Partly impelled by concern over agriculture's impact on the environment, Congress passed the Soil and Water Resources Conservation Act of 1977 (RCA). The act mandated a continuing appraisal of the Nation's soil, water, and related resources. From this information, USDA was to develop a long-term National Resources Program.

The second National Conservation Program was issued in 1988 and set priorities through 1997. It calls for reduced erosion and improved water quality, and encourages State and local governments to assume additional responsibility in soil and water conservation. The results from the studies, debates, and pilot projects started under RCA found their way into national farm legislation, first in the 1981 farm bill, and to a much greater extent in the Food Security Act of 1985.

The Conservation Reserve Program is intended to remove highly erodible land from production by paying farmers an annual rental for 10 years under a contract. The conservation provisions of the 1985 farm bill required that farmers comply with these environmental objectives if they wished to continue to participate in certain other agricultural programs, such as commodity price supports, crop insurance, loans, and farm storage facility loans. Under the "Highly Erodible Land" provision, farmers had until 1990 to develop a conservation plan, approved by USDA and local conservation districts, and until 1995 to complete the implementation of the conservation plan.

Sodbuster, another part of the Highly Erodible Lands provision, was designed to discourage erodible land from being brought into production. If land had not been used for an annual crop during 1981-85, it could not be used for crop production unless acceptable conservation methods were used. The Swampbuster provision, officially titled "Wetland Conservation," was included to slow the conversion of wetlands to cropland. Farmers who converted wetland and produced agricultural commodities on it after December 23, 1985, the date of the act's passage, would be ineligible for certain USDA program benefits.

The Task of Making Laws Work

Within USDA, SCS has generally provided the technical assistance and advice while the Agricultural Stabilization and Conservation Service (ASCS) has handled financial assistance.

Bringing the intent of the conservation provisions of the Food Security Act of 1985 from the halls of Congress to farm operations has required substantial work. This includes writing definitions, establishing rules and procedures, and giving the public time to offer opinions and suggestions.

The field staff in about 2,800 field offices has dealt directly with conservation districts and farmers. That work has kept SCS and ASCS busy during the past 5 years and will require most of the time of the SCS staff for the coming 4 years. After developing the criteria for defining highly erodible lands, SCS field staff identified the highly erodible land with soil surveys and field examinations. The agency accelerated soil surveys to areas not already covered by the published soil surveys.

SCS and other Federal agencies, especially the U.S. Fish and Wildlife Service of the Department of the Interior, took the definition of wetlands in the farm bill and developed criteria for identification in the field. In 1988, SCS started making inventories of wetlands. In some areas where wetland inventorying has progressed, especially in the pothole region of the North-Central States, many farmers have appealed the designation of some of their lands as wetlands for purposes of the Food Security Act, and local SCS employees in those areas must review these appeals.

The 1985 law required that farmers have a conservation plan by January 1, 1990, and that they fully implement it by January 1, 1995, in order to stay eligible for a variety of USDA programs. The task for SCS field staff was to formulate 1.3 million plans covering 135 million acres. Farmers and SCS now face a greater task than writing plans--designing and installing, by 1995, all of the conservation practices that have been agreed to in the plans.

New Role for SCS

The work associated with the Food Security Act of 1985 created a new, unaccustomed role for the agency and the field staff. Previously, SCS worked strictly on a voluntary basis. Now SCS must make decisions about whether farmers are complying with the law. A vast majority of farmers participate in farm programs to some extent and are affected by the law.

One method used to reduce erosion has been to take erodible land out of production. As a requirement for participating in Government price support programs started in the 1930s, farmers often had to set aside lands on an annual basis. The Soil Bank of the late 1950s and early 1960s promoted a longer term shifting of cropland to trees or grass through contracts. The general criticism of these programs has been that the purpose of the price support programs was to reduce crop acreage rather than to conserve soil. In the case of the Soil Bank, the program was not aimed at the most erodible land; farmers could sign contracts and enroll any land they chose.

Under the Conservation Reserve Program (CRP), only land determined to be highly erodible was eligible. From the time of the sixth signup under the CRP in 1988, the criteria have been changed at intervals to allow the entrance of filter strips, floodplain scour lands, and finally wetlands into the program. These lands, however, constitute only a very small fraction of the acres allowed. As of 1990, landowners have enrolled 34 million acres in the CRP. SCS also gives advice on planting methods used to establish grasses and then checks to ensure that the work has been done properly.

Impact on Water Quality

Another concern related to agriculture has been the impact of agriculture on water quality. Part of the concern involves the sediment in water caused by erosion. The use of irrigation can lead to salinity problems. Dairying or raising livestock in a small space, with many such operations concentrated within a watershed, can also cause water quality problems. One of the most complicated problems is determining the exact effect of agricultural chemicals such as nutrients and pesticides. While the first task is understanding the nature and the extent of the problem, there is then the challenge of devising practical remedial measures and getting landowners to use them.

One of the earliest efforts to understand the water quality problem came out of the Great Lakes Water Quality Agreement with Canada in 1972. In that agreement, USDA

and the Canadians defined the problem and developed solutions.

During the 1970s USDA learned a great deal from the Rural Clean Water Program (RCWP), which included a number of pilot and demonstration projects. The projects tested the value of various methods as well as the feasibility of getting farmers to use them.

President George Bush's State of the Union message on February 9, 1989, included a major water quality initiative that pertained to the work of several agencies.

One of the most promising recent developments in water quality has been greater cooperation within USDA to give farmers advice on the use of agricultural chemicals at the same time that they receive advice on soil and water conservation measures.

Since the 1960s, entomologists in the Extension Service, State experiment stations, and Agricultural Research Service have worked on integrated pest management systems. One of the objectives of these systems is to reduce the amount of chemicals used in insect control. At the same time, agronomists in these agencies have developed ways to use chemical nutrients so that there will be little runoff into surface water or seepage into the ground water.

SCS has worked with the Extension Service to develop recommendations in SCS's technical guides, usually one for each county, that will include information about where and when these chemicals can be used effectively, but in a manner that keeps movement to ground and surface waters to a minimum. These same technical guides also provide the basic information on soil and water conservation measures. The promise is for a better environment through greater cooperation within USDA and, hence, greater service to farmers.

Looking Forward

Concern over the environment seems to be a constant and prominent feature on the political landscapes of both the recent past and the near future. Farmers and the State and Federal agencies with which they work will live in this climate of concern. But in a larger sense the recent legislation is part of a longer quest for agriculture that fits the environment, in which the impetus for adaptation is not a response to legislation but an acknowledgment of the forces of nature.

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